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**REPORT NO. 2
FINAL REPORT
CONTRACT NO. 3Z6248
(REPORT NO. 251, MRCE SERIES)
BRANCH AVENUE STORAGE YARD
SECTION F011, BRANCH ROUTE
SUPPLEMENTARY SUBSURFACE INVESTIGATION**

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Results are summarized herein of 11 supplementary borings and eight test pits to investigate subsurface conditions in the Branch Avenue storage yard. The report contains geological sections which summarize information from the borings, logs of borings, results of laboratory tests on samples recovered and a text describing design and contraction problems.

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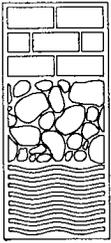
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March 9, 1998

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Re: Branch Avenue Storage Yard
Section F011, Branch Route
Final Report, Supplementary Subsurface Investigation
MRCE File No. 8737

Dear Mr. Szczur:

In accordance with our contract, we submit herewith 13 copies of this final report for the subsurface investigation for the Branch Avenue Yard in Section F011 of Branch Route. Single copies of the report are being sent at the same time to the Section Designer and WMATA F-Route management. Following the established schedules, a draft of preliminary report was submitted on December 3, 1997. Comments received from WMATA and Section Designer on the preliminary report have been incorporated in this final report. We believe that this completes the planned investigation in Section F011.

Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

By: _____


Hugh S. Lacy

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1.0 INTRODUCTION

1.1 Authorization

Contract No. 3Z6248 between DeLeuw, Cather and Company (DCCO) and Mueser Rutledge Consulting Engineers (MRCE) provides for subsurface investigations, laboratory testing and summary reports relating to certain sections of the Rapid Transit System. One portion of that contract covers the making of 11 borings and eight test pits at various locations within the planned Branch Avenue Storage Yard Section F011 of Branch Route. This geotechnical investigation supplements a previous investigation at this site conducted between April and June, 1997. The paragraph below describes the discussions leading to the final scope of work agreed upon.

On July 30, 1997, the Section Designer, Rummel Klepper and Kahl (RK&K) requested a group of 17 supplementary borings to provide final design information on the character of the soils that would be encountered at the planned storage yard, taking into consideration the recent changes in the yard layout. After revisions by WMATA management, the final scope of work comprised 11 borings, Nos. YB-38U through YB-48U, and four test pits Nos. TP-1 through TP-4. Four additional shallow test pits Nos. TP-1A through TP-4A were excavated to recover soil samples in order to obtain information on the character of the existing fill. Exploratory work started on October 1, 1997, after WMATA's authorization to proceed. The field work was completed on October 14, 1997.

The following MRCE reports contain exploratory data obtained previously in Sections F004 to F011, or information relevant to this section:

1. Final Report, Subsurface Investigation, Branch Route, Stations 106+60 (F003) to 454+00 (F008), dated February 1973 (MRWJ Series Report No. 78).
2. Final Report, Subsurface Investigation, Branch Route, "B" Corridor Alignment, Sections 178+28 to 484+00 (F004 to F008), dated November 15, 1975 (MRWJ Series Report No. 142).
3. Supplementary Subsurface Investigation, Section F006 to F008, dated June 22, 1981 (MRJD Series Report No. 166).

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4. Supplementary Subsurface Investigation, Final Report, Section F010, Branch Route, dated March 7, 1994 (MRCE Series Report No. 241).
5. Supplementary Subsurface Investigation, Final Report, Section F008, Branch Route, dated March 11, 1994 (MRCE Series Report No. 243).
6. Supplementary Subsurface Investigation, Final Report, Section F006, Branch Route, dated February 2, 1995 (MRCE Series Report No. 242).
7. Supplementary Subsurface Investigation, Final Report, Section F009, Branch Route, dated February 9, 1995 (MRCE Series Report No. 244).
8. Supplementary Subsurface Investigation, Final Report, Section F007, Branch Route, dated February 28, 1995 (MRCE Series Report No. 245).
9. Supplementary Subsurface Investigation, Final Report, Section F010, Branch Route, dated March 31, 1995 (MRCE Series Report No. 246).
10. Supplementary Subsurface Investigation, Final Report, Section F010, Branch Route, dated April 26, 1996 (MRCE Series Report No. 247).
11. Subsurface Investigation, Final Report, Section F011, Branch Route, dated August 29, 1997 (MRCE Series Report No. 250).

1.2 Scope of Work

The completed work comprised a group of 11 borings designated as YB-38U through YB-48U and eight test pits Nos. TP-1 through TP-4 and TP-1A through TP-4A. All borings and test pits were made by National Foundation Engineering, Inc. (NFE), under subcontract to Earth Engineering and Sciences, Inc., (EESI). The borings were inspected and logged by NFE. An MRCE representative was present on a part-time basis at the site during the course of boring operations to insure that the work was performed in accordance with Metro standards. The boreholes were made by conventional soil boring methods utilizing a tricone roller bit with the aid of drilling mud or water to advance the hole. The test pits were excavated with a backhoe. Observation wells were installed in 4 of the borings for continuing measurement of groundwater levels. All boreholes except those containing observation wells were grouted at completion. All test pits were excavated and backfilled the same day.

All soil samples recovered from the borings and test pits were transported to our New York City laboratory for examination, check of field classifications and performance of identification testing and engineering properties tests. Soil samples remaining after the laboratory testing was completed

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were returned to Washington, DC to be stored at the designated storage facility. No soil samples were recovered for corrosion testing.

1.3 General Features of the Project

As shown on the Boring Location Plan, Drawings Nos. F-F-472 through F-F-474, the storage yard is located in the parcel of land directly north of the limit of Section F010, bordered on the east by a tributary of Henson Creek and on the west by the Capital Gateway Drive, in Prince George's County, Maryland. General location plan on Drawing No. SK-1 shows in synoptic form the location of the yard. Facilities starting from the north end of the yard consist of an operations/maintenance building, chemical/equipment storage, traction power substation, car maintenance (CMNT) shop facility, and a car wash building. A retaining wall borders the northern limit of the yard. Three storm water management ponds will be located within the yard complex. The two lead tracks feed a gang of tracks located in the north half of the yard starting from approximate Elev. 243 at the south, sloping downwards to about Elev. 236 at the north end of the yard. The northeastern section of the yard will be in a substantial new controlled fill of up to about 25 feet in thickness with the edge of the embankment sloping to the east to lower ground. Cut slopes up to 25 ft in depth will be made to provide for a parking lot and entrance road in the western central part of the site.

2.0 TEST BORINGS AND LABORATORY PROGRAM

2.1 Presentation of Boring Data

Locations of all 11 borings and eight test pits are shown on Drawing Nos. F-F-472 through F-F-474. Locations of the geological sections as well as the principal yard features are also shown on these drawings. Information from the 11 current borings as well as earlier borings of YB series is plotted in a series of Geological Sections, A1-A1 through K1-K1, presented on Drawings Nos. F-F-475 through F-F-479. All Sections are drawn at a scale distortion of one to four.

Soil data plotted on the geological sections include sample number designation and position, standard sample penetration resistance, Unified Soil Classification (USCS), water contents of fine grained soils, Atterberg limits and shear strengths in ksf. Also shown on the sections are the results of grain size tests on representative soil samples from the borings, giving the percent by dry weight of particles passing the Nos. 200 and 40 sieves and of the gravel retained upon the No. 4 sieve. The legend explaining these test symbols is shown on the bottom of Drawing No. F-F-475.

Final logs of the completed 11 borings and eight test pits are being presented on Drawings Nos. F-F-480 through F-F-483. These logs are based on laboratory examination of soil samples and identification testing, and they may differ in detailed interpretation from the driller's logs, copies of

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which were placed on file with WMATA. Coordinate locations and ground surface elevations of the borings are listed in Table No. 1. General Information Drawing No. F-1 presents notes and legend applicable to both the geological sections and boring log drawings. This drawing also summarizes the sequence of the principal soil strata with their general description.

2.2 Laboratory Testing Program

Three-inch undisturbed samples were recovered by pushing thin Shelby tubes. Accepted samples were transported to our New York city laboratory for tests of engineering properties. These tests comprised determination of shear strength by unconsolidated-undrained triaxial shear test and one consolidation test. In addition, Atterberg limit tests and grain size determinations were performed. The results of these tests are listed in Table No. 2, Summary of Laboratory Test Data. All split- spoon samples were examined in the laboratory, field classifications were checked and water contents determined for fine grained soils. Atterberg limit values were determined for typical clays of Strata F, Ec and Mc. Results of the plasticity tests are plotted on Plate No. 1. A total of eighteen grain size determinations were made on fill material and Tertiary soils of Aquia formation of Strata Es, Ec and upper Cretaceous soils of Monmouth formation of Stratum Ms. Results are plotted on Plates Nos. 2 through 6. Sixteen unconsolidated-undrained triaxial tests were performed on Tertiary soils of Strata Ec, Es and upper Cretaceous of Stratum Ms. Results of these tests are presented on Plates Nos. 7 through 12. One consolidation test was performed on a plastic clay of Stratum Ec and results are presented on Plate No. 13. Two CBR tests were performed on sand and plastic clay samples of Stratum F. Results are presented on Plate Nos. 14 and 15.

Table No. 5 summarizes properties of soils of Tertiary and upper Cretaceous strata. This table is intended for use in design of permanent structures. Specific boring records and laboratory test results for the formation at the location of interest should be consulted in selecting parameters for design, since Table No. 5 values are generalized over a wide area. The allowable soil bearing capacities for spread foundations of the structures in Section F011 are given in Section 4 of this report.

2.3 Field Permeability Tests

Four falling-head permeability tests were performed in the four observation wells installed in the YB-Series borings. Results of permeability tests are plotted in Table No. 3 which gives basic information on circumstances of the tests, stratum tested and average computed coefficients of permeability. The highest computed permeability value is equal to 7.0×10^{-5} feet per minute in materials of Stratum Ec. Because of muddy conditions in the borehole and in filter material of observation wells and the impracticability of keeping the hole open in the cleanest and most pervious materials, the resulting permeability values tend to be low. They are not comparable in reliability to field pumping test results. Table No. 4 lists generalized coefficients of permeabilities of the Tertiary strata based on full scale, deep-well pumping tests in earlier WMATA studies made primarily in the Pleistocene and Cretaceous strata. That information has been extrapolated to the

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Tertiary and upper Cretaceous soils on the basis of a comparison of identification properties. These values chiefly reflect the horizontal permeability because of the flow conditions to the test wells.

2.4 Groundwater Conditions

Water levels measured in observation wells installed in earlier borings and the borings made for this investigation are indicated on the geological sections by a solid triangular symbol for the current borings and by an open triangular symbol for the earlier borings. An average water table position estimated from this group of readings is indicated by a dashed line on the geological sections. In general, the groundwater level is a subdued reflection of the ground surface and it rises from a low at about Elev. 190 at the north end of the yard to a high about Elev. 250 on the west limit of the yard in the vicinity of Boring No. YB-42. In general, the groundwater table slopes from west to east of the yard towards the tributary of the Henson Creek.

3.0 SUBSURFACE CONDITIONS

3.1 General Geology

The principal materials encountered at the site of the planned yard comprise Tertiary marine deposits of Brandywine of Stratum Q2, Calvert sands and clays of Strata Cs and Cc, Aquia sands and clays of Strata Es and Ec and upper Cretaceous Monmouth sands and clays of Strata Ms and Mc, beneath fill ranging in thickness between five and 40 feet.

3.2 Strata Descriptions

3.2.1 Stratum F A substantial amount of fill has been placed in the yard area following gravel quarry operations, as depicted on Drawings Nos. SK-2 through SK-4. The contours of elevations depict the old ground surface between 1951 and 1979. The fill has been placed in an uncontrolled condition and consists of loose to very compact silty to clayey fine sand, trace to some gravel, to gravelly fine to coarse sand, trace to some clay, clay pockets mixed with silty to sandy clay, sandy to clayey silt and plastic clay. Varying amounts of cemented sand pieces, brick, concrete fragments, asphalt, wood, vegetation, lignite, glass, roots, leaves and rubble obstruction were encountered in some of the earlier and current borings between ground surface and approximately 4 feet depth with the exception of Boring No. YB-28, where rubble fill mixed with soil was encountered to 18 feet depth. No rubble fill was detected in the test pits. Rubble material was observed at the ground surface in the southwest area of the yard in the general vicinity of Borings Nos. YB-28 and YB-29U. In the adjacent Section F010, the fill contained building rubble including a massive concrete slab within the excavation for the Branch Avenue Station. Several grain size tests were performed on selected sandy soil samples recovered from some of the borings and test pits, as depicted on Plates Nos. 2, 5 and 6. Atterberg limit tests were performed on representative clay samples, with results

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presented on Plate No. 1.

3.2.2 Stratum Q2 Stratum Q2 of the Brandywine formation consists of medium compact to very compact brown, tan or yellow orange fine to coarse sand, some gravel and boulders, to fine to coarse sandy gravel, trace to some silt and clay with occasional silty fine sand layers. It was encountered in current Boring No. YB-47 and in earlier Borings Nos. YB-2U, YB-27U, YB-31U, DM-60 and 10-13. It appears that the Brandywine has been stripped from the site in the quarrying operations, except at scattered locations noted above.

3.2.3 Stratum Cc Stratum Cc of the Calvert formation consists of plastic clay, silty clay and sandy clay or clayey silt. These clays are substantially overconsolidated to stresses of 7 to 12 tsf. Shear strength increases with depth from about 1.5 to 2.5 ksf, as shown on Plate No. 12 from MRCE Series Report No. 78, bound in Appendix A of this report. This stratum was encountered in some of the borings interlayered with sands of Stratum Cs.

3.2.4 Stratum Cs Stratum Cs of the Calvert formation is a loose to medium compact fine sand, trace to some silt, clay and silty or clayey fine sand. These sands were encountered in some of the borings interlayered at certain locations with clays of Stratum Cc. Standard Penetration Test resistance is generally in the range of 5 to 10 blows per foot, occasionally up to 30 blows per foot. The wide variation in Standard Penetration Test resistance is apparently due to sampling techniques and does not represent an actual variation in densities of the stratum. The sands are remarkably single-sized and it appears likely that positive pore pressures are built up by driving the sampler which accounts for the exceptionally low blow counts. Although Stratum Cs is rated as loose to medium compact based on the Standard Penetration Test resistance recorded in the borings, the actual consistency can be classified as medium compact as demonstrated by the results of direct shear tests presented on Plate No. A-55 bound in the Appendix of this report.

3.2.5 Stratum Ec Stratum Ec of the Aquia formation consists of medium to stiff gray, green, olive gray slickensided and fissured plastic clay to silty and sandy clay or clayey silt, trace lignite with occasional slightly organic fine sandy and silty clay layers, trace shells. This is the oldest of the Tertiary marine sediments found in most of the borings and it is interlayered at certain locations with Aquia sands of Stratum Es. Results of Atterberg limits determinations are plotted in Plate No. 1 of this report and in Plate No. 14 of the MRCE Series Report No. 78, bound in Appendix A of this report. Median values are: liquid limit, 55; plastic limit, 30; plasticity index, 25. Strength and consolidation properties, summarized in profile on Plate No. 14, indicate that typical preconsolidation stresses range from about 7.5 to 8.5 tsf, and shear strengths increase with depth from about 2 to 3.5 ksf. Natural water contents are generally positioned midway between the liquid and plastic limits, with typical values of about 40 to 45 percent. The median shear strength value from 21 triaxial shear tests and from earlier strength tests on undisturbed samples from the current and earlier YB-Series borings is 1.6 ksf. Median shear strengths from earlier testing in Sections F009 and F010 are summarized in the table below. The low strength in the current and earlier testing may be due to numerous slickensides and fissures in the clays at this site. The results of one consolidation test on a plastic clay, Sample No. 9U from Boring No. YB-40U, disclosed a preconsolidation stress of 4.6 tsf.

SECTION	REPORT NUMBER	MEDIAN SHEAR STRENGTH (KSF)
F009	244	3.6
F010	246	3.1
F011	250 & 251	1.6

3.2.6 Stratum Es Aquia Stratum Es consists of loose to medium compact gray, green, olive gray silty and clayey fine sand, trace shells with occasional slightly organic silty and clayey fine sand layers. This stratum is interlayered at certain locations with Aquia clays of Stratum Ec. Standard penetration resistance is generally between 5 and 10 blows per foot, with occasional blow counts as high as 50 blows per foot. As in the case of the Calvert sands, the wide variation in Standard Penetration Test resistance is apparently due to sampling techniques, and does not represent a true variation in consistency. Although the stratum is rated as loose to medium compact based on the Standard Penetration Tests resistance recorded in the borings, the actual consistency can be classified as a medium compact based on the results of strength tests on undisturbed samples of Es sands conducted for this as well as for earlier WMATA investigations. The results of triaxial tests on undisturbed samples of Es sands from YB-Series in Section F011, DM-Series borings in Section F010, and RKK-Series borings in Section F009 are shown on Table No. 2 of the corresponding reports. Copies of Table No. 2 from reports for Sections F009 and F010 are bound in Appendix A of this report. The shear strength ranges between 0.9 and 3.8 ksf. Direct shear tests were carried out on undisturbed samples from Borings Nos. F-204U and F-207U in the 1975 subsurface investigation summarized in MRCE Series Report No. 142. These tests disclosed angles of internal friction in the range of 32° to 40.5°, as shown on Plates Nos. A56 and A57 of Report No. 142. Results of all the above tests are included in Appendix A of this report.

3.2.7 Stratum Mc Stratum Mc of the upper Cretaceous Monmouth formation comprises medium compact to very compact dark green slightly organic micaceous fine sandy silt, and very stiff to hard clayey silt, some shells and irregular lenses and layers of calcium cemented sand and shell hash. This stratum was encountered only in a few of the borings interlayered with Monmouth sands of Stratum Ms. This material is heavily preconsolidated, in excess of 10 tsf.

3.2.8 Stratum Ms Monmouth sands of Stratum Ms consist of medium compact to very compact dark green slightly organic micaceous silty fine sand, trace clay and clayey fine sand, some shells, plus irregular lenses of cemented sand and shell hash. The Ms sands are occasionally interlayered with Mc clays. Standard Penetration Test resistance is generally high and in many instances exceeds 100 blows per foot, reflecting the presence of lenses or layers of cemented sands and shells. Various amounts of cemented sand layers were encountered in recent Borings Nos. YB-38U and YB-40U and earlier Borings Nos. YB-1, YB-3, YB-4U, YB-5, YB-18 and YB-25. Hard drilling was experienced in the borings when drilling into the Monmouth formation. Pile driving in this material in Section F010 was difficult. Blasting was used in many instances to penetrate this stratum with

a precast concrete pile fitted with a "stinger".

The median shear strength from seven triaxial shear tests in the YB-Series Borings is 3.8 ksf. The median triaxial shear tests from earlier investigations in Sections F008 and F010 are summarized in the table below. The medians are shown on Plate No. 12 of MRCE Series Report No. 78.

DESIGN SECTION	REPORT NUMBER	MEDIAN SHEAR STRENGTH VALUE (KSF)
F008	243	3.6
F010	246	3.6
F011	250 & 251	3.8

4.0 SUMMARY OF DESIGN AND CONSTRUCTION PROBLEMS

Recommended general design parameters for the soils below this site are summarized in Table No. 5. Design parameters at specific locations are discussed in the previous section of this report. The following sections describe foundation conditions and recommendations for individual areas.

4.1 Yard Earthwork

As depicted on Location Plan Drawings Nos. F-F-472 through F-F-474, the existing ground elevation within the yard ranges from a low at Elev. 210 in the vicinity of Boring No. YB-7 to a high at Elev. 253 in the area of Boring No. YB-27U. Subgrade planned for the Yard ranges between Elev. 236 and Elev. 243 at the north and south side of the yard, respectively. The area north of Station 25+00 on the Y10 track will be on a new controlled fill embankment up to about 25 feet high. The east limit of the fill will drop at the minimum slope of two horizontal to one vertical. Intermediate berms will be required to intercept the surface runoff. The new fill is intended to meet WMATA Specification requirements for "materials for embankment", Section 204, Article 2.1.A, compacted in accordance with requirements of Article 3.5. The embankment fill is to be placed up to the base of the trackage sub-ballast. The existing ground should be stripped of top soil and roots and then heavily proofrolled prior to placing the controlled fill. Undercutting will be necessary in areas where soft yielding soils are revealed by the proofrolling. The embankment design should include evaluation of the mass stability of the fill slope.

4.2 Retaining Wall No. 2

As depicted on Drawing No. F-F-472, Retaining Wall No. 2 is located along the northern perimeter of the yard bounded east and west by Borings Nos. YB-3 and YB-1, respectively. The purpose of the

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wall is to retain the fill that will be placed to support the yard trackage. Subsurface conditions are presented on Geological Section A1-A1 on Drawing No. F-F-475. The retaining wall is about 20 feet high with its top at Elev. 240.8. Existing subsoils consist of a fill layer ranging in thickness between about five and 30 feet. The greatest thickness of fill was encountered in Borings Nos. YB-2U and YB-37. Underlying the fill are sands and gravel of Brandywine and clays and sands of Calvert, Aquia and Monmouth formations. The top of the Monmouth formation is relatively level and ranges between about Elev. 175 and Elev. 179. The groundwater level ranges between about Elev. 188 and Elev. 200.

A spread bearing foundation is not suitable for the retaining wall due to the underlying thick uncontrolled fill and high toe pressures resulting from the new retained fill. Therefore, pile support for the retaining wall will be necessary. Piles of up to 50 ton capacity could consist of precast concrete or closed-end pipe piles. To develop 50 ton pile capacity, we estimate pile tip penetration below the top of the Monmouth formation of about 10 to 15 feet. The choice of pile type will be influenced by market conditions. At least one pile load test should be planned to evaluate the typical pile penetration necessary for the selected design load. Because of the presence of cemented sand layers in the Monmouth formation, pile installation could prove to be difficult. Prospective contractors should get information from WMATA on pile installation problems in Section F010 before submitting their bids.

An alternative to a conventional cast-in-place concrete retaining wall might be considered for Retaining Wall No. 2. This could consist of driven soldier piles with pre-cast concrete lagging, faced with architectural concrete panels or shotcrete. Driven piles in an A-frame at the soldier piles might be considered to take the horizontal force. Because of loss of metal due to potential stray current corrosion, the choice of working stress should be conservative. Another alternative that could be considered is a reinforced earth wall as used in Section E007 of Greenbelt Route, or a crib wall alternative. The advantage of these two latter types of walls is that they are flexible and can readily adjust to differential settlements. The design should include evaluation of mass stability of the slope modified by the new embankment above the pile supported retaining wall, taking into consideration the presence of the planned SWM Pond No. 2 located adjacent to the retaining wall.

4.3 Operations/Maintenance Building

This building is located at the northwest area of the yard as shown on Drawing No. F-F-472. Subsoils are illustrated in Geological Section B1-B1 on Drawing No. F-F-475. Subsoils consist of a layer of fill ranging in thickness between five and 22 feet underlain by sands and clays of Brandywine, Calvert, Aquia and Monmouth formations. The finished floor of the building is at Elev. 239 bearing on approximately 15 feet of new controlled fill. The building is relatively light, and settlement of the existing granular fill and highly preconsolidated Calvert and Aquia formations due to the weight of the superposed new fill and building will occur rapidly. Therefore, the operations/maintenance building can be founded on spread bearing on the surface of the controlled select fill, at the maximum bearing pressure of 1 1/2 tons per square foot. The area within the building should be heavily proofrolled prior to placing the controlled fill to a level of four feet below the base of the slab on

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grade using "materials for embankment" fill meeting WMATA Specification, Section 204, Article 2.1.A. This should be topped to an elevation of six inches below the bottom of the floor slab with controlled fill of "select material" meeting WMATA Specification, Section 204, Article 2.1.B. A six inch "drainage material" meeting WMATA Specification, Section 204, Article 2.1.D should be placed on top of the fill prior to casting the floor slab.

4.4 Chemical Equipment Storage Building and Fueling Facility

The chemical equipment storage building is located in the northwest area of the yard as shown on Drawing No. F-F-472. Subsoil conditions are depicted on Geological Section C1-C1. Subsoils consist of a relatively thin layer of fill overlying Calvert clays and Aquia clays and sands. The groundwater level is about Elev. 205. The subgrade will be on a new controlled fill with finished floor at Elev. 235. We recommend that the existing fill within the building area be removed, and the area backfilled with controlled "select fill" material meeting WMATA Specification Section 204, Article 2.1.B to a level of six inches below the floor slab. Then six inches of "drainage material" meeting WMATA Specifications, Section 204, Article 2.1.D, should be placed on top of the fill prior to casting the floor slab. The building can be founded on spread bearing on the surface of the select controlled fill, at a maximum bearing pressure of 1 1/2 tons per square foot.

Based on interpolation of subsurface conditions encountered in Borings Nos. YB-14 and YB-32U, foundation subgrade for the fueling facility will be at or near the top of the Calvert formation. The existing fill should be removed and the area backfilled with controlled select fill in the area where the top of the Calvert foundation is below the base of the foundations of the fueling facility. Spread foundations for the facility could be designed for a maximum bearing pressure of 1 1/2 tons per square foot.

4.5 Traction Power Substation

Location of this building is shown on Drawing No. F-F-473. Subsurface conditions are depicted in Geological Section D1-D1 presented on Drawing No. F-F-476. Subsoils consist of a layer of fill about 15 feet thick overlying Aquia sands and clays followed by Monmouth formation. The groundwater table is about Elev. 215. The finished floor is at Elev. 237 bearing on a new embankment of controlled select fill averaging 10 feet thick. The building can be founded on spread bearing at a maximum bearing pressure of 1 1/2 tons per square foot. The existing fill within the building should be removed to about Elev. 225, then the surface proofrolled, and the area backfilled to the level of six inches below the bottom of the slab on grade with controlled fill of "select material" meeting WMATA Specification, Section 204, Article 2.1.B. A six-inch layer of "drainage material" meeting WMATA Specification, Section 204, Article 2.1.D should be placed on top of the fill prior to casting the floor slab.

4.6 CMNT Shop Facility

As shown on Drawing No. F-F-473 this building is located in the middle of the yard bordered by Boring Nos. YB-18, YB-19, YB-21U, YB-22 and YB-40U. Subsurface conditions are depicted in a series of four Geological Sections E1-E1 through H1-H1 presented on Drawings Nos. F-F-477 and F-F-478. Subsoils consist of a layer of fill between 20 and 40 feet thick overlaying sands and clays of Aquia and Monmouth formations with the top of the latter being at about Elev. 170. Groundwater level varies between approximately Elev. 220 and Elev. 240. The top of ground floor slab is at Elev. 239, underlain by uncontrolled fill ranging in thickness between about five and 25 feet. Because of the presence of a thick layer of uncontrolled fill below the base of the building foundation spread bearing foundations are not feasible and the building must be supported on piles. The piles could consist of pre-cast concrete or closed-end pipe piles of up to 50 ton capacity driven between 10 and 15 feet into the Monmouth formation. Groundwater control will be necessary during the construction of the building foundations. At least one pile load test should be planned to evaluate the typical pile penetration necessary for the selected design load. The ground floor slab should be structurally supported between pile caps to prevent cracking due to potential settlement of the ground between columns.

4.7 Car-Wash Building

The planned car wash building is located near the south end of the yard between Borings Nos. YB-26 and YB-27U, made during the April 1997 subsurface investigation, as shown on the boring location plan on Drawing No. F-F-474. Subsurface conditions are presented on Geological Section J-J on Drawing No. F-F-463 originally included in MRCE Series Report No. 250. The finished floor of the building is at about Elev. 242. Subsoils consists of a relatively thin layer of fill overlying interlayered sands and clays of Strata Cs, Es and Ec. The existing groundwater level ranges between Elev. 225 and Elev. 230. The central part of the building extends through the edge of an existing SWM pond. We recommend that the existing fill be removed, and the area backfilled with controlled "select fill" to six inches below the bottom of the ground floor slab, meeting WMATA Specifications, Section 204, Article 2.1.B, and then a six inch layer of "drainage material" meeting WMATA Specifications, Section 204, Article 2.1.D, be placed on top of the select fill prior to casing the ground floor slab. The car wash building can then be founded on spread bearing on the surface of the controlled select fill at a maximum bearing intensity of 1 1/2 tons per square foot. We recommend that the existing pond be emptied prior to the construction of building foundation and measures be undertaken to control the surface runoff during the excavation and backfilling operations.

4.8 North Parking Lot

The planned north parking lot, Borings Nos. YB-32U and YB-46 and Test Pits Nos. TP-4 and TP-4A are located directly west of the operations/maintenance building and chemical storage facility as shown on Boring Location Plan on Drawing No. F-F-472. Geological Section C1-C1 through the north parking lot is presented on Drawing F-F-476. Subsurface conditions consist of a layer of fill

ranging in thickness between about 5 and 12 feet, overlying sands and clays of Aquia and Monmouth formations. Subgrade will be at about Elev. 235 on a new fill ranging in thickness between about two feet and ten feet thick at the south and north end of the lot, respectively. The existing fill consists of silty fine sand to fine sand, some silt. The groundwater level is about 10 feet below the existing ground surface. A CBR test performed in the laboratory on this material recovered from Test Pit No. TP-4A disclosed a value of 12.5 as shown on Plates Nos. 14 and 15. The top soil should be removed from the existing ground surface and the area thoroughly proofrolled before placing the controlled fill "materials for embankment" meeting WMATA Specification, Section 204, Article 2.1.1.A. Because of the possibility of the presence of clay layers within the fill a CBR not higher than 7 can be used for the design of the flexible pavement. Changes in drainage patterns can encourage uneven settlement of the pavement. It would be advisable to give the pavement a sufficient slope to avoid sag ponds.

4.9 South Parking Lot

The south parking lot is located directly west of the CMNT shop facility as shown on the Boring Location Plan of Drawing No. F-F-473. Geologic Sections E1-E1 through G1-G1 through the parking lot are presented on Drawings Nos. F-F-477 and F-F-478. Subsurface conditions consist of a layer of fill averaging about 30 feet in thickness overlying clays and sands of Aquia and Monmouth formations. The existing groundwater level ranges between about Elev. 235 and Elev. 250, or approximately between two feet and 12 feet above planned final subgrade. The existing fill consists of plastic clay and silty clay with silty sand and clayey sand layers. A CBR test was performed on plastic clay fill material recovered from Test Pit No. TP-1A at 8 foot depth. The test disclosed a CBR equal to 4.3.

The parking lot subgrade will be at about Elev. 238 on the existing fill, roughly between 10 and 25 feet below existing ground surface. Following excavation to subgrade, the existing fill should be thoroughly proofrolled before placing the pavement base course. A CBR of 5 can be used for the design of the flexible pavement. Since there can be continuing settlements of the old fill, the pavement surface and the underdrainage pipes should be given somewhat exaggerated slopes so that sags do not develop that impede drainage. Control of the groundwater inflow from the cuts into higher ground on the south will be necessary for the construction of the parking lot pavement. Surface drainage from the top of the excavation slopes should be directed in ditches along the slope crest to lower ground. The slopes should be stabilized from erosion by appropriate planting.

4.10 Use of Excavated Material as Borrow

The portion of the Yard north of about Boring No. YB-17 will be in substantial new controlled fill of up to 25 feet in thickness with the edge of the embankment sloping to the east to lower ground. The estimated volume of new fill is approximately 275,000 cubic yards. The portion of the yard south of the same boring will be in a cut of up to 20 feet comprising primarily existing fill, consisting of plastic clay and silty clay mixed with varying amounts of silty and clayey sand, with the exception of the cut for the construction of SWM Pond 1 located west of the car wash building which will be

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primarily of Calvert sand of Stratum Cs and Aquia clays of Stratum Ec. The estimated volume of total excavated material is about 475,000 cubic yards. The results of earlier borings and current borings and test pits disclosed that existing fill from excavated areas will generally not be suitable for use as select fill or specified embankment fill. It may be possible to obtain satisfactory embankment fill meeting WMATA Specifications from some of the required excavation through careful sorting and/or processing or screening of the excavated soil.

The problem in using excavated material for compacted embankment is the likelihood that the borrow will arrive on the embankment at a moisture content too high for effective compaction. Disposal off the site of the excavated material that does not meet WMATA Specifications could be expensive; therefore, it is suggested that this material be used to fill in landscaped areas around or away from the structures.

TABLE NO. 1, SURVEY DATA FOR BORINGS (SECTION FO11, BRANCH AVENUE YARD)

BORING NUMBER	HORIZONTAL CONTROL COORDINATES:		VERTICAL CONTROL: GROUND SURFACE ELEVATION (FT)	STATUS OF OBSERVATION WELLS		
	NORTH	EAST		INSTALLED	TYPE	PRESENT CONDITION
YB-38U	362,579	826,704	225.3	10-14-97	1-1/2"	F
YB-39	362,128	826,876	253.8			
YB-40U	361,961	826,803	247.9			
YB-41	362,085	826,483	244.0			
YB-42	361,875	826,487	266.7			
YB-43	361,813	826,626	265.9			
YB-44	361,719	826,837	263.4	10-02-97	1-1/2"	F
YB-45	363,741	826,241	224.5			
YB-46	363,576	826,230	224.6	10-08-97	1-1/2"	F
YB-47	363,793	826,144	224.8			
YB-48U	363,556	826,483	225.5	10-07-97	1-1/2"	F
TP-1	362,268	826,497	247.5			
TP-2	361,069	826,849	251.6			
TP-3	361,807	826,994	246.7			
TP-4	363,292	826,200	232.4			
TP-1A	362,260	826,488	247.4			
TP-2A	361,062	826,830	251.6			
TP-3A	361,787	826,994	246.7			
TP-4A	363,292	826,220	232.4			

LEGEND

F - Indicates observation well functioning in 1997.

TABLE NO. 2

SUMMARY OF LABORATORY TEST DATA

SAMPLE IDENTIFICATION				CLASSIFICATION PROPERTIES								PHYSICAL PROPERTIES															
												STRENGTH					CONSOLIDATION										
BORING NUMBER	SAMPLE NUMBER	DEPTH FT.	STRATUM DESIGNATION	NATURAL WATER CONTENT % (W) AVERAGE OF ENTIRE SAMPLE	LIQUID LIMIT (WL)	PLASTICITY INDEX (Ip)	NATURAL WATER CONTENT OF LIMIT SAMPLE, W _n , %	SPECIFIC GRAVITY OF SOLIDS (G _s)	DRY DENSITY, PCF	UNIFIED SOIL CLASSIFICATION SYSTEM		UNCONFINED COMPRESSION			TRIAXIAL COMPRESSION					EXISTING OVERBURDEN STRESS P ₀ , TSF	ESTIMATED PRECONSOLIDATION STRESS, P _c , TSF	COMPRESSION INDEX, C _c	SWELLING INDEX, C _s	VOID RATIO AT START OF SWELL, e _r			
										SOIL TYPE	% SAND (<# 4 >#200 SIEVE)	% FINES (<#200 SIEVE)	COMPRESSIVE STRENGTH TSF	WATER CONTENT AT END OF TEST, %	STRAIN AT FAILURE, %	TYPE OF TEST	DEVIATOR STRESS (σ ₁ -σ ₃), TSF	CONFINING PRESSURE (σ ₃), TSF	NATURAL WATER CONTENT, W _n , %						WATER CONTENT AT END OF TEST, W _n , %	NATURAL WATER CONTENT, W _n , %	
YB-38U	7U	19	Ec	41	53	16	49			ML ML ML	46	54				Q Q Q	1.40 1.64 1.76	0.5 1.0 2.0	40 40 43	41 40 43							
	10U	29	Es	34						SM-SC SM-SC SM-SC	79	21				Q Q Q	1.50 1.68 1.03	0.5 1.0 2.0	34 33 33	35 33 35							
YB-40U	9U	29	Ec	40	77	52	39	2.76		CH CH						Q Q	*0.26 *0.31	0.5 1.0	40 40	40 40	37	1.4	4.6	0.46	0.090	0.499	
	11U	39	Ec	40						CL		50				Q	1.36	2.0	40	40							
	21U	89	Ms	29						SM-SC SM-SC	62	38				Q Q	5.00 6.41	1.0 2.0	29 28	29 30							
YB-48U	11U	39	Es	48						SM-SC SM-SC SM-SC	61	39				Q Q Q	1.21 1.68 0.89	0.5 1.0 2.0	51 47 45	51 47 47							
	13U	49	Es	34						SM-SC	80	19				Q Q	3.33 4.08	1.0 2.0	36 31	35 31							

- ALL TESTS SUMMARIZED ABOVE WERE PERFORMED IN THE SOILS LABORATORY OF MUESER RUTLEDGE CONSULTING ENGINEERS.
 - THE SAMPLE DEPTH LISTED ABOVE IS THE AVERAGE DEPTH OF THE SAMPLE RECOVERED.
 - FOR GROUND SURFACE ELEVATIONS AT THE BORINGS SEE TABLE NO. 1. FOR GENERALIZED STRATA DESCRIPTIONS SEE DRAWING NO. F-1.
 - "NATURAL WATER CONTENT OF THE ENTIRE SAMPLE" IS A WEIGHTED AVERAGE OF ALL MATERIAL TYPES RECOVERED.
 - THE TRIAXIAL COMPRESSION TESTS PERFORMED WERE:
 Q - QUICK TESTS (U_U - UNCONSOLIDATED UNDRAINED TESTS)
 Q_c - CONSOLIDATED QUICK TESTS (CU - CONSOLIDATED UNDRAINED TESTS)
 - STRENGTH TESTS WERE PERFORMED ON PISTON TYPE SAMPLES (U) APPROXIMATELY 2.9 INCHES IN DIAMETER AND ON SHELBY TYPE SAMPLES (S) APPROXIMATELY 1.8 INCHES IN DIAMETER. THE RATIO OF HEIGHT TO DIAMETER OF ALL STRENGTH TEST SPECIMENS WAS APPROXIMATELY 2.0.
 - THE TRIAXIAL COMPRESSION TESTS WERE PERFORMED AT A RATE OF STRAIN OF APPROXIMATELY 1 PER CENT PER MINUTE.
 - THE DIRECT SHEAR TESTS WERE PERFORMED AT A CONSTANT RATE OF STRAIN EQUAL TO A HORIZONTAL DISPLACEMENT OF 0.02 INCHES PER HOUR. THE SPECIMENS WERE OF APPROXIMATELY 1/2 INCH THICKNESS.
 - COMPRESSION INDEX C_c - STRAIGHT LINE PORTION OF THE VIRGIN CURVE OF CONSOLIDATION TEST: $e = e_0 - C_c \text{ LOG } P/P_0$
 - SWELLING INDEX C_s - STRAIGHT LINE PORTION OF THE REBOUND CURVE OF CONSOLIDATION TEST: $e = e_0 - C_s \text{ LOG } P/P_0$
- *SAMPLE FAILED ON SLICKENSIDED PLANES.

MUESER RUTLEDGE CONSULTING ENGINEERS
 708 THIRD AVENUE, NEW YORK, N.Y., 10017

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DELEUW, CATHER AND COMPANY
 GENERAL ENGINEERING CONSULTANTS

TABLE NO. 3, SUMMARY OF RISING AND FALLING HEAD PERMEABILITY TESTS IN BSERVATION WELLS (SECTION F011)

BORING NO.	YB-38U	YB-44	YB-46	YB-48U		
TYPE OF TEST	FALLING HEAD	FALLING HEAD	FALLING HEAD	FALLING HEAD		
ELEVATION OF TOP AND BOTTOM OF OPENING TESTED	+ 197.3 + 140.3	+ 228.4 + 213.4	+ 186.6 + 174.6	+ 177.5 + 145.5		
LENGTH OF OPENING IN FEET	57	15	12	32		
AVERAGE COMPUTED PERMEABILITY, FEET/MINUTE	3.6×10^{-5}	7.0×10^{-5}	3.7×10^{-5}	5.8×10^{-5}		
STRATUM TESTED	Es, Ec, Mc & Ms	Ec	Es, Ec & Mc	Es, Mc & Ms		

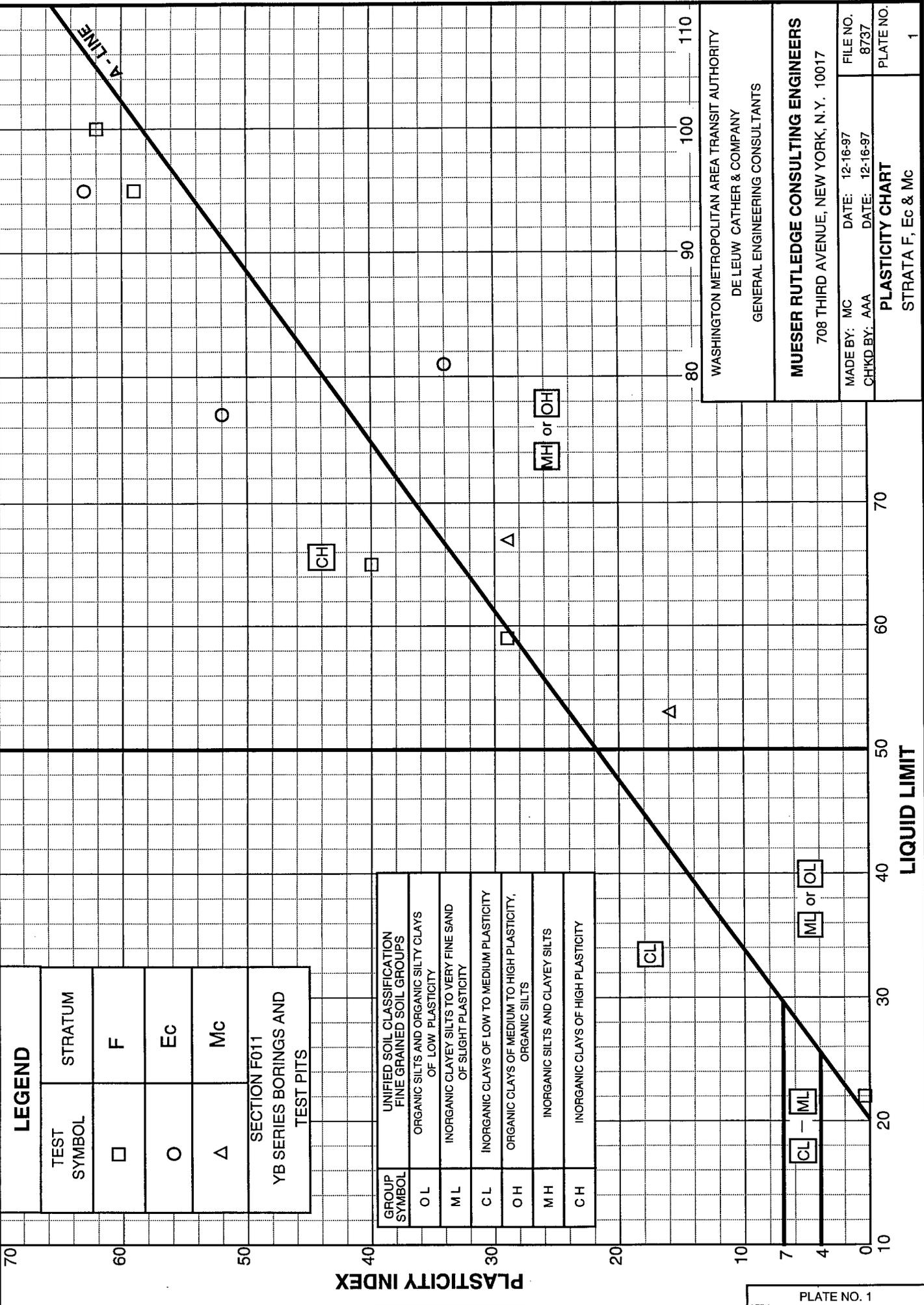
BORING NO.						
TYPE OF TEST						
ELEVATION OF TOP AND BOTTOM OF OPENING TESTED						
LENGTH OF OPENING IN FEET						
AVERAGE COMPUTED PERMEABILITY, FEET/MINUTE						
STRATUM TESTED						

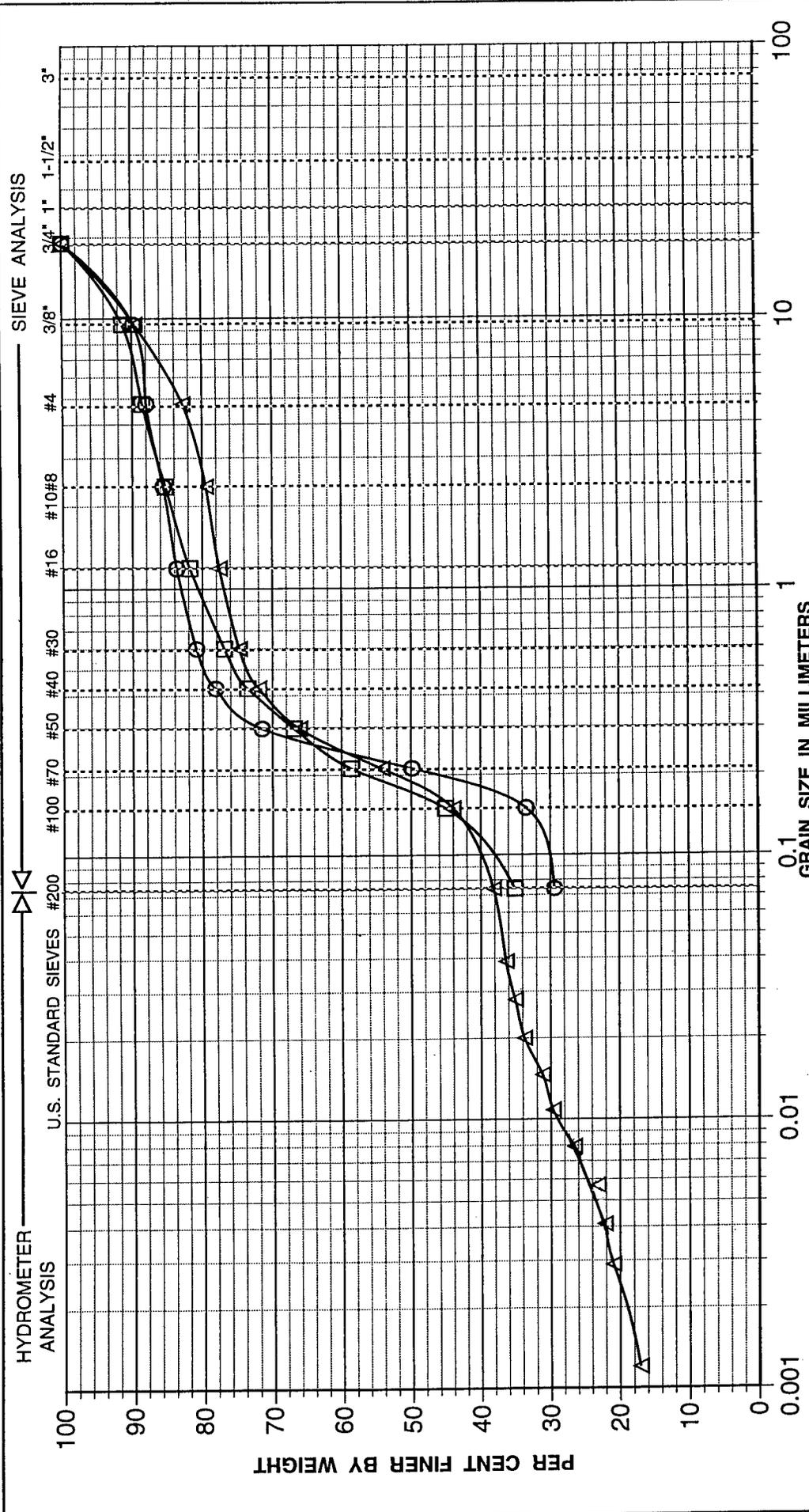
**TABLE NO. 4
REPRESENTATIVE PERMEABILITY VALUES**

STRATUM	SOIL TYPE	COEFFICIENT OF PERMEABILITY K, (FT/MIN)
Q2	Fine to coarse sand, some medium to coarse gravel	5×10^{-2} to 10^{-3}
Cc	Plastic clay, silty and sandy clay or clayey silt	10^{-6} to 10^{-7}
Cs	Fine sand, trace to some silt, clay and clayey fine sand	10^{-3} to 10^{-5}
Ec	Plastic clay to silty and sandy clay or clayey silt	10^{-6} to 10^{-7}
Es	Silty and clayey fine sand	10^{-3} to 10^{-5}
Mc	Slightly organic fine sandy silt and clayey silt	10^{-5} to 10^{-6}
Ms	Slightly organic micaceous silty or clayey fine sand	10^{-3} to 10^{-5}

**TABLE NO. 5
SOIL PROPERTIES FOR DESIGN**

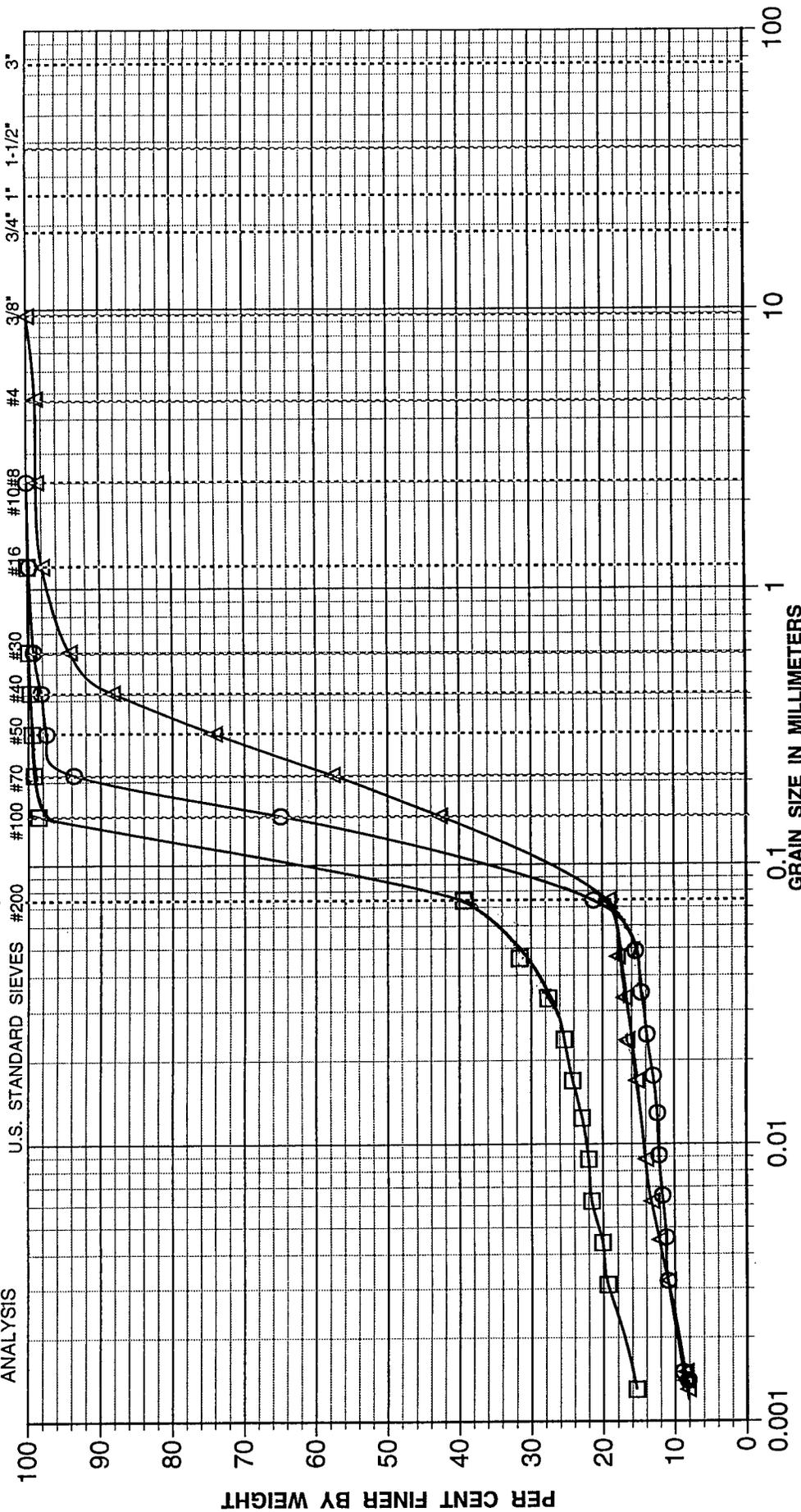
STRATUM	TOTAL UNIT WEIGHT (PCF)	EFFECTIVE FRICTION ANGLE ϕ	UNDRAINED SHEAR STRENGTH (KSF)	POISSON'S RATIO μ	COEFFICIENT OF SUBGRADE REACTION (KCF)	RECOMPRESSION CONSOLIDATION INDEX (CR)	COEFFICIENT OF AT-REST PRESSURE	YOUNG MODULUS OF ELASTICITY (KSI)
F Existing Fill	120-130	30°	-	-	-	-	-	-
Q2 Fine to coarse sand, some medium to coarse gravel	130	38°	-	0.35-0.4	180	.01-.02	.4	12-15
Cc Plastic clay, silty and sandy clay or clayey silt	130	25°	1.5-2.5	0.3-0.35	100	.015-.03	.55	6-8
Cs Fine sand, trace to some silt, clay and clayey fine sand	130	30°-32°	-	0.3-0.35	140	.01-.02	.5	8-10
Ec Plastic clay to silty and sandy clay or clayey silt	130	25°	2.0-3.5	0.35-0.4	100	.015-.03	.55	6-8
Es Silty and clayey fine sand	130	30°-32°	-	0.35-0.4	140	.01-.02	.5	8-10
Mc Slightly organic fine sandy silt and clayey silt	130	25°	3.0-3.5	0.35-0.4	120	.015-.03	.6	8-10
Ms Slightly organic micaceous silty or clayey fine sand	130	32°-34°	-	0.35-0.4	160	.01-.02	.45	10-12





DESCRIPTION OF SAMPLE		STRATUM (F)	
SYMBOL	BORING		
○	YB-42		
□	YB-42	4D	
△	YB-44	6D	
		2D	
PLATE NO. 2			
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DeLEUW, CATHER AND COMPANY GENERAL ENGINEERING CONSULTANTS			
MUESER RUTLEDGE CONSULTING ENGINEERS			
708 THIRD AVENUE, NEW YORK, N.Y. 10017			
MADE BY: MC	DATE: 11-18-97	FILE NO.	8737
CHKD BY: AAA	DATE: 11-18-97	GRADATION CURVES	PLATE NO. 2
STRATUM (F)			

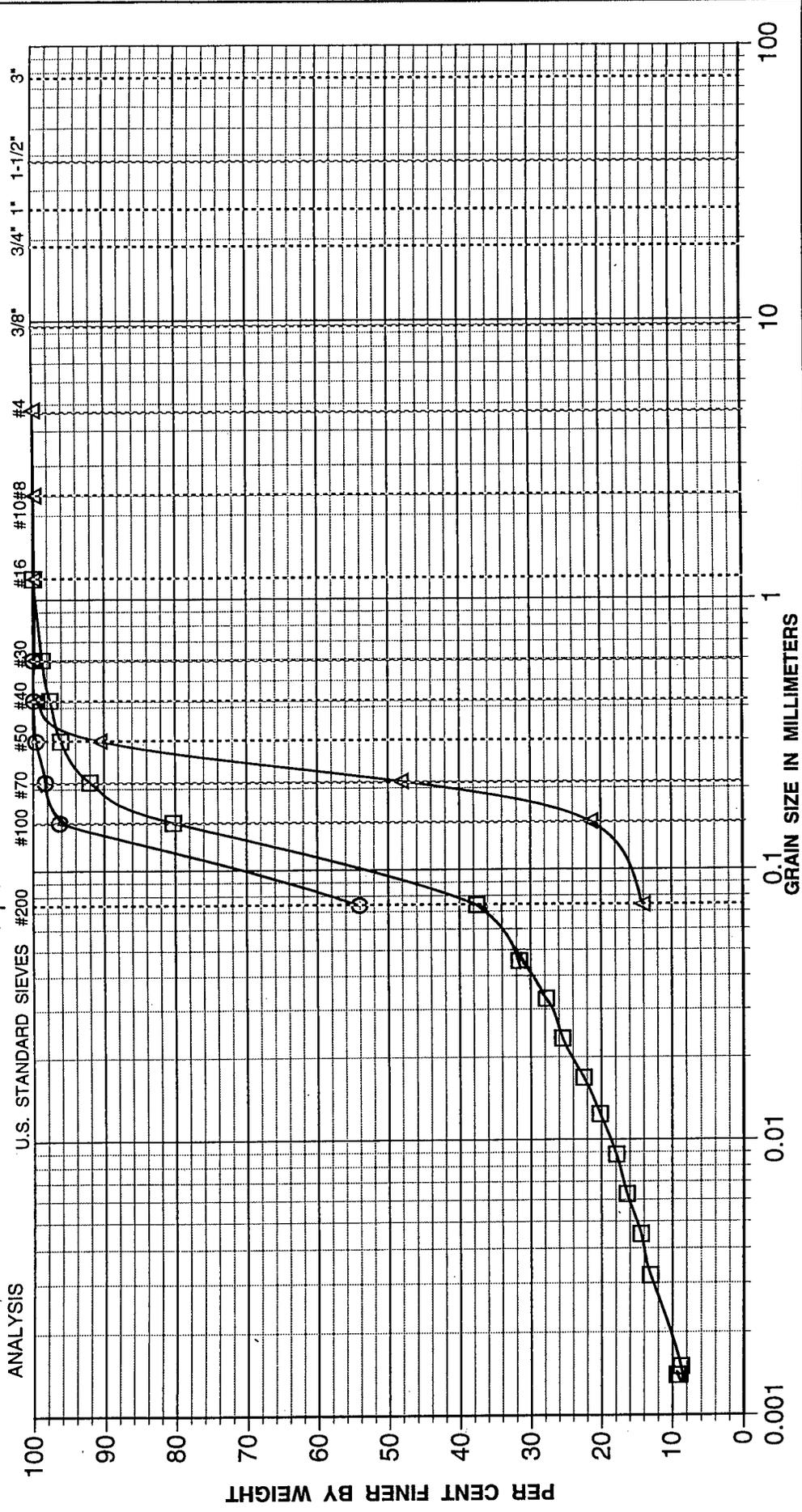
HYDROMETER ANALYSIS ———— SIEVE ANALYSIS



UNIFIED SOILS CLASSIFICATION		CLAY OR SILT		SAND		GRAVEL		COBBLES			
		FINE		MEDIUM		FINE		COARSE			
DESCRIPTION OF SAMPLE		<p>STRATUM (Es)</p>									
SYMBOL	BORING										SAMPLE
○	YB-38U										10U
□	YB-48U	11U									
△	YB-48U	13U									
<p>WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DeLEUW, CATHER AND COMPANY GENERAL ENGINEERING CONSULTANTS</p> <p>MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017</p> <p>MADE BY: MC DATE: 11-18-97 FILE NO. 8737 CHKD BY: AAA DATE: 11-18-97</p> <p>GRADATION CURVES STRATUM (Es) 3</p>											

PLATE NO. 3

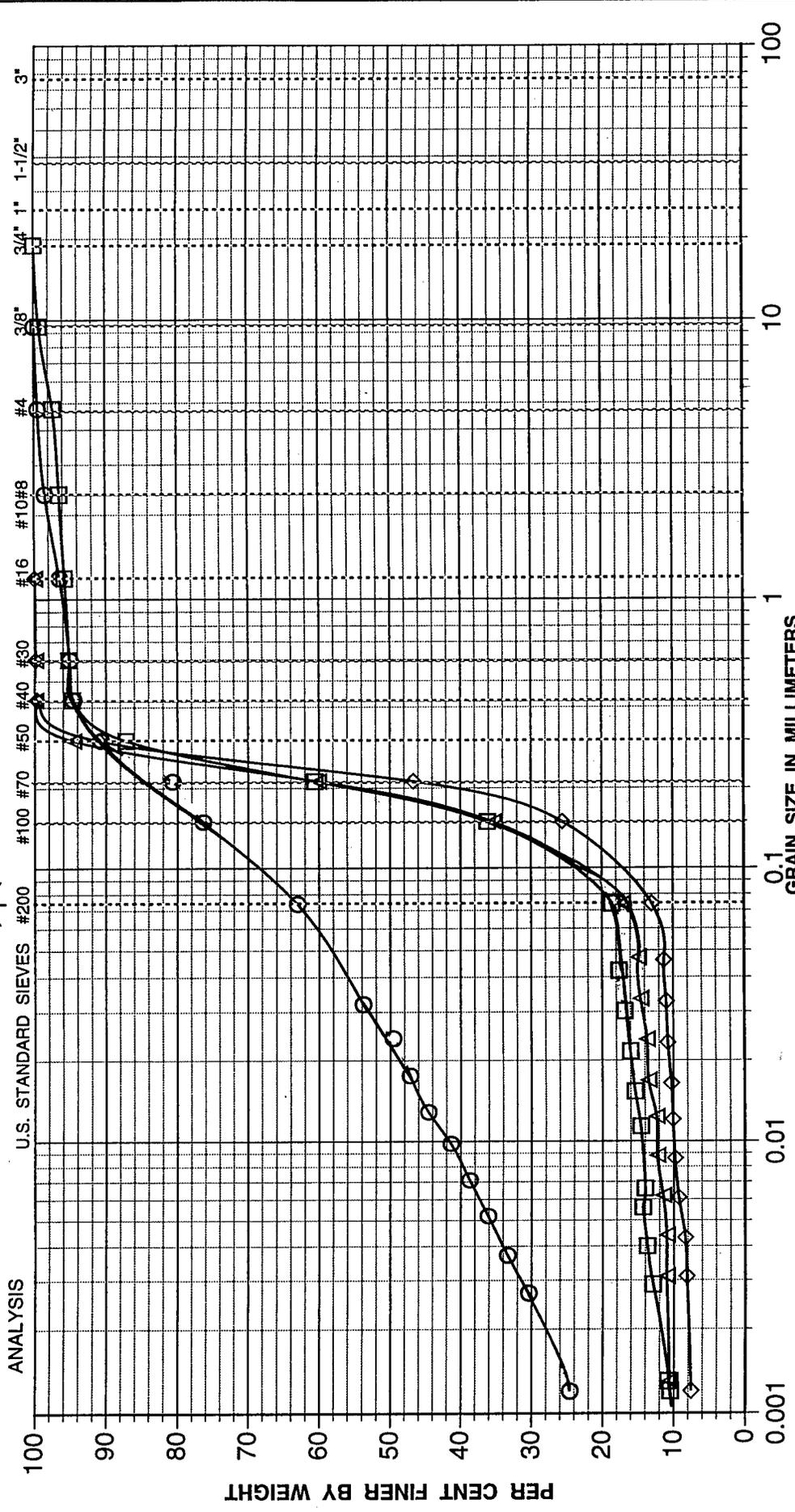
HYDROMETER ANALYSIS ——— SIEVE ANALYSIS



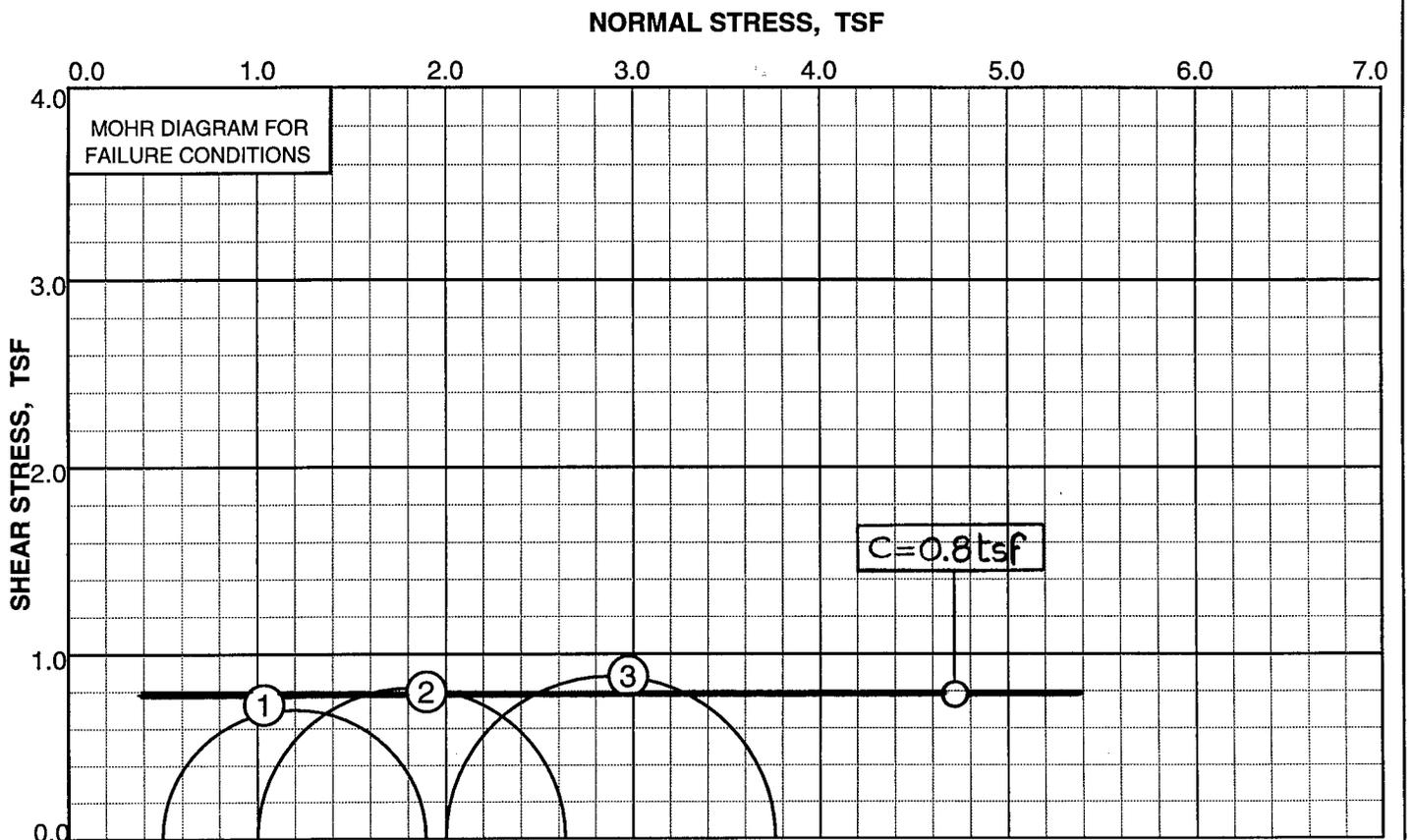
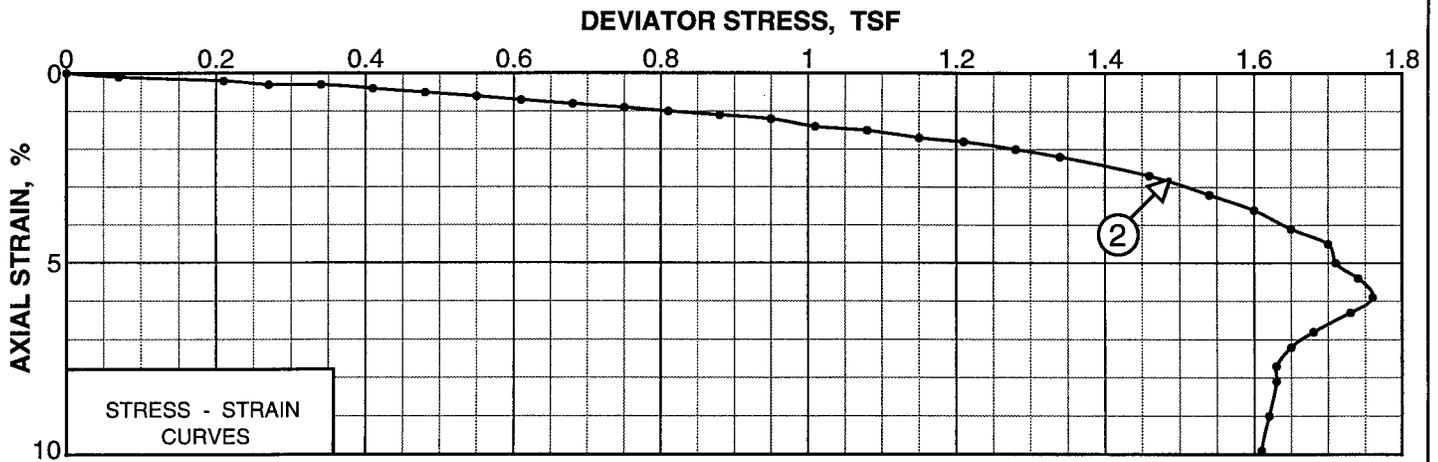
UNIFIED SOILS CLASSIFICATION		CLAY OR SILT		SAND		GRAVEL	
		FINE		MEDIUM		COARSE	
		FINE		COARSE		COBBLES	
SYMBOL		BORING		SAMPLE		DESCRIPTION OF SAMPLE	
○	YB-38U		7U			STRATA (Es), (Ec) & (Ms)	
□	YB-40U		21U				
△	YB-44		6D				
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DeLEUW, CATHER AND COMPANY GENERAL ENGINEERING CONSULTANTS MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017							
MADE BY: MC		DATE: 11-18-97		FILE NO.		8737	
CHK'D BY: AAA		DATE: 11-18-97		GRADATION CURVES		STRATUM (Es), (Ec) & (Ms)	
				PLATE NO.		4	

HYDROMETER ANALYSIS

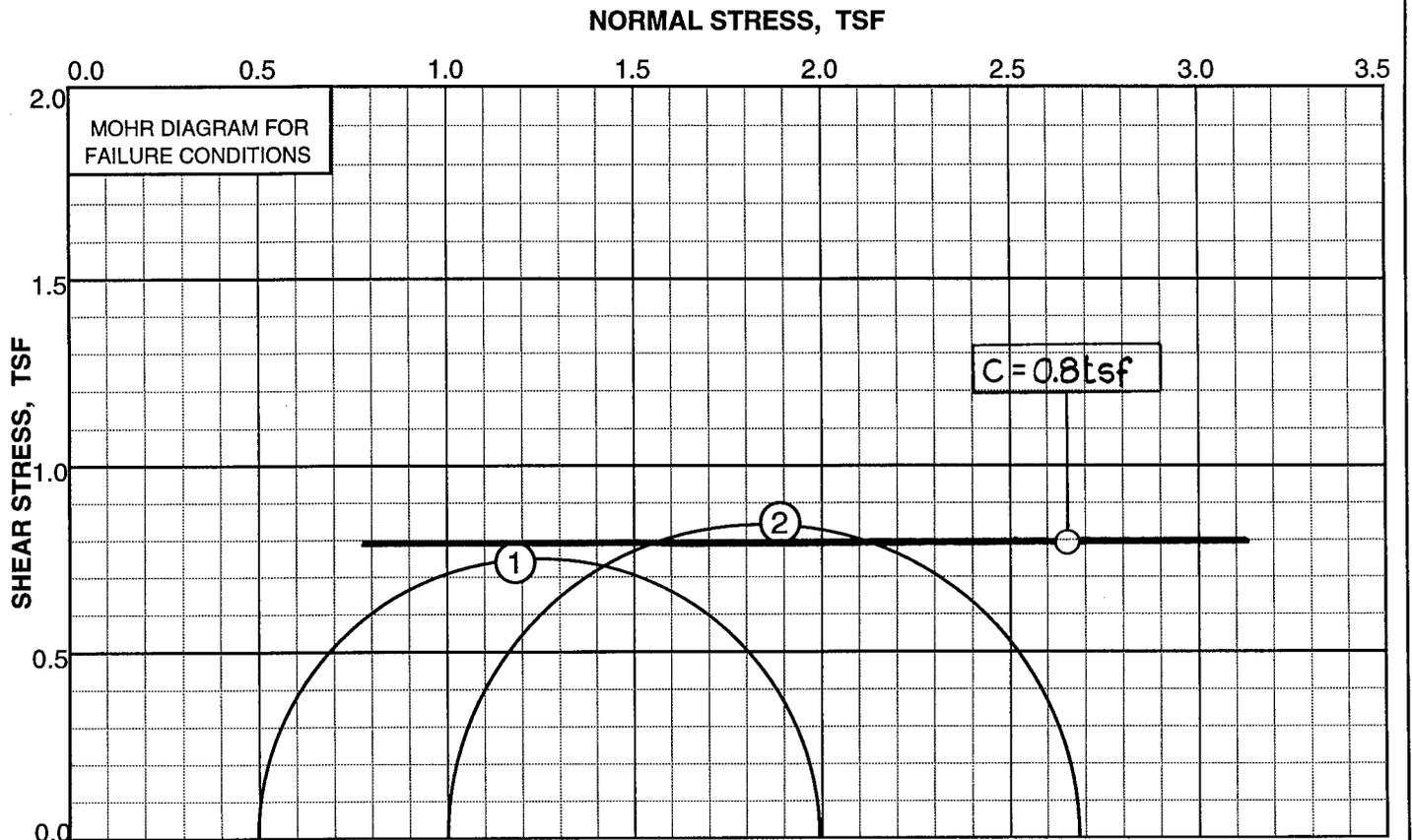
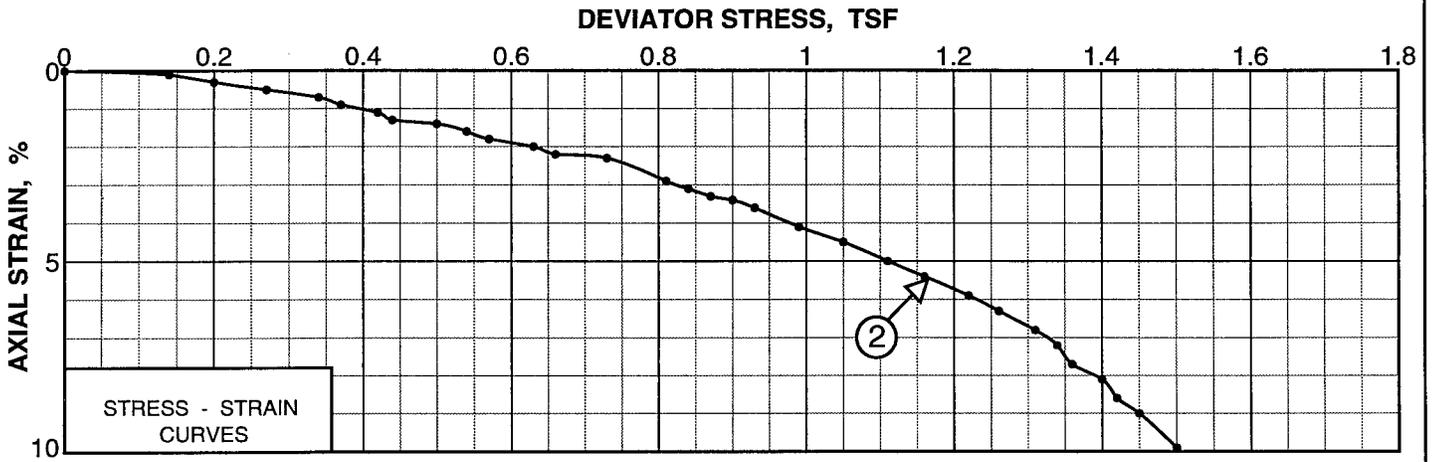
SIEVE ANALYSIS



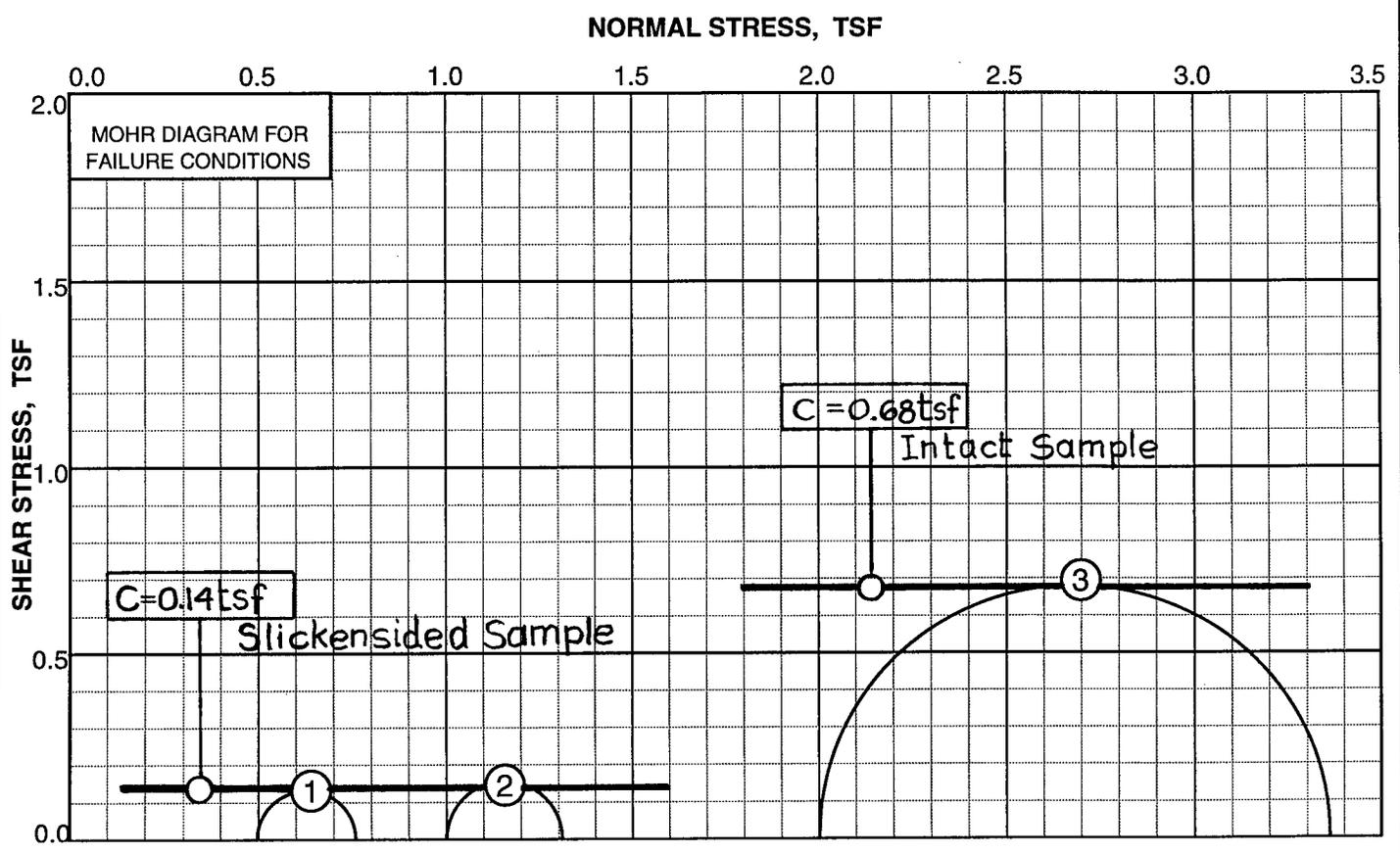
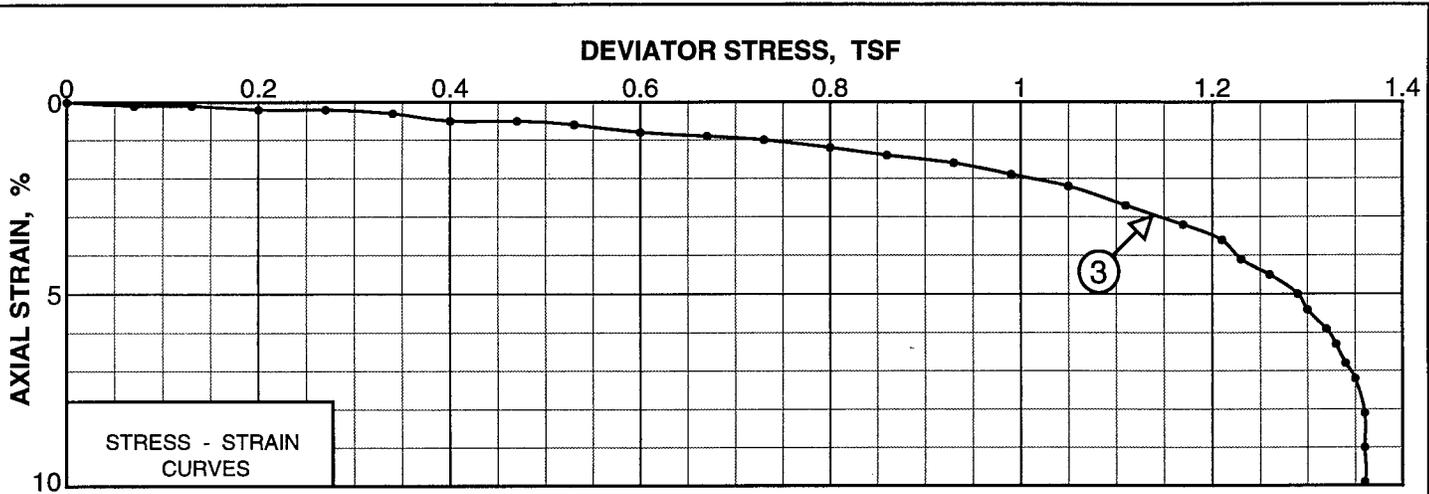
UNIFIED SOILS CLASSIFICATION		CLAY OR SILT		SAND		GRAVEL		
		FINE		MEDIUM		COARSE		
		FINE		COARSE		FINE		
		COARSE		COARSE		COBBLES		
SYMBOL		SAMPLE	TEST PIT	DEPTH, FT.	DESCRIPTION OF SAMPLE			
○	3B	TP-3	10	STRATUM (F)				
□	2B&3B	TP-3A	8					
△		TP-4	5 & 9					
◇		TP-4A	5					
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DELEUW, CATHER AND COMPANY GENERAL ENGINEERING CONSULTANTS				MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017				
MADE BY: MC		DATE: 11-25-97		FILE NO.				
CHK'D BY: AAA		DATE: 11-25-97		8737				
GRADATION CURVES				STRATUM (F)		PLATE NO. 6		



DESCRIPTION OF MATERIAL TESTED											SYMBOLS FOR TEST TYPES			
GRAY FINE SANDY SILT, TRACE CLAY, CLAY POCKETS											Q- UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST			
STRATUM (Ec)														
KEY	BORING NO.	SAMPLE NO.	SOIL TYPE	TEST TYPE	LATERAL PRESSURE TSF	WATER CONTENT-%		DEGREE OF SATURATION-%		DEVIATOR STRESS TSF	AXIAL STRAIN %	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEUW, CATHER & COMPANY GENERAL ENGINEERING CONSULTANTS		
						INITIAL	FINAL	INITIAL	FINAL					
1	YB-38U	7U	ML	Q	0.5	40	41			1.40	18.0			
2	YB-38U	7U	ML	Q	1.0	40	40			1.64	13.5			
3	YB-38U	7U	ML	Q	2.0	43	43			1.76	5.9			
											MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017			
											MADE BY: MC		DATE: 11-25-97	FILE NO.
											CH'KD BY: AAA		DATE: 11-25-97	8737
											SUMMARY OF STRENGTH TESTS		PLATE NO.	
											BORING NO. YB-38U		7	



DESCRIPTION OF MATERIAL TESTED											SYMBOLS FOR TEST TYPES			
GRAY GREEN FINE SAND, SOME SILT, TRACE CLAY, CLAY LAYERS											Q- UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST			
STRATUM (Es)														
KEY	BORING NO.	SAMPLE NO.	SOIL TYPE	TEST TYPE	LATERAL PRESSURE TSF	WATER CONTENT-%		DEGREE OF SATURATION-%		DEVIATOR STRESS TSF	AXIAL STRAIN %	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEUW, CATHER & COMPANY GENERAL ENGINEERING CONSULTANTS		
						INITIAL	FINAL	INITIAL	FINAL					
1	YB-38U	10U	SM-SC	Q	0.5	34	35			1.50	15.4			
2	YB-38U	10U	SM-SC	Q	1.0	33	33			1.68	18.1			
MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017											MADE BY: MC		DATE: 11-25-97	FILE NO.
											CH'KD BY: AAA		DATE: 11-25-97	8737
SUMMARY OF STRENGTH TESTS											BORING NO, YB-38U		PLATE NO.	
													8	



DESCRIPTION OF MATERIAL TESTED										SYMBOLS FOR TEST TYPES	
GRAY CLAY TO FINE SANDY CLAY										Q- UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST	
STRATUM (Ec)											
KEY	BORING NO.	SAMPLE NO.	SOIL TYPE	TEST TYPE	LATERAL PRESSURE TSF	WATER CONTENT-%		DEGREE OF SATURATION-%		DEVIATOR STRESS TSF	AXIAL STRAIN %
						INITIAL	FINAL	INITIAL	FINAL		
1	YB-40U	9U	CH	Q	0.5	40	40			*0.26	4.0
2	YB-40U	9U	CH	Q	1.0	40	40			*0.31	3.5
3	YB-40U	11U	CL	Q	2.0	40	40			1.36	8.1

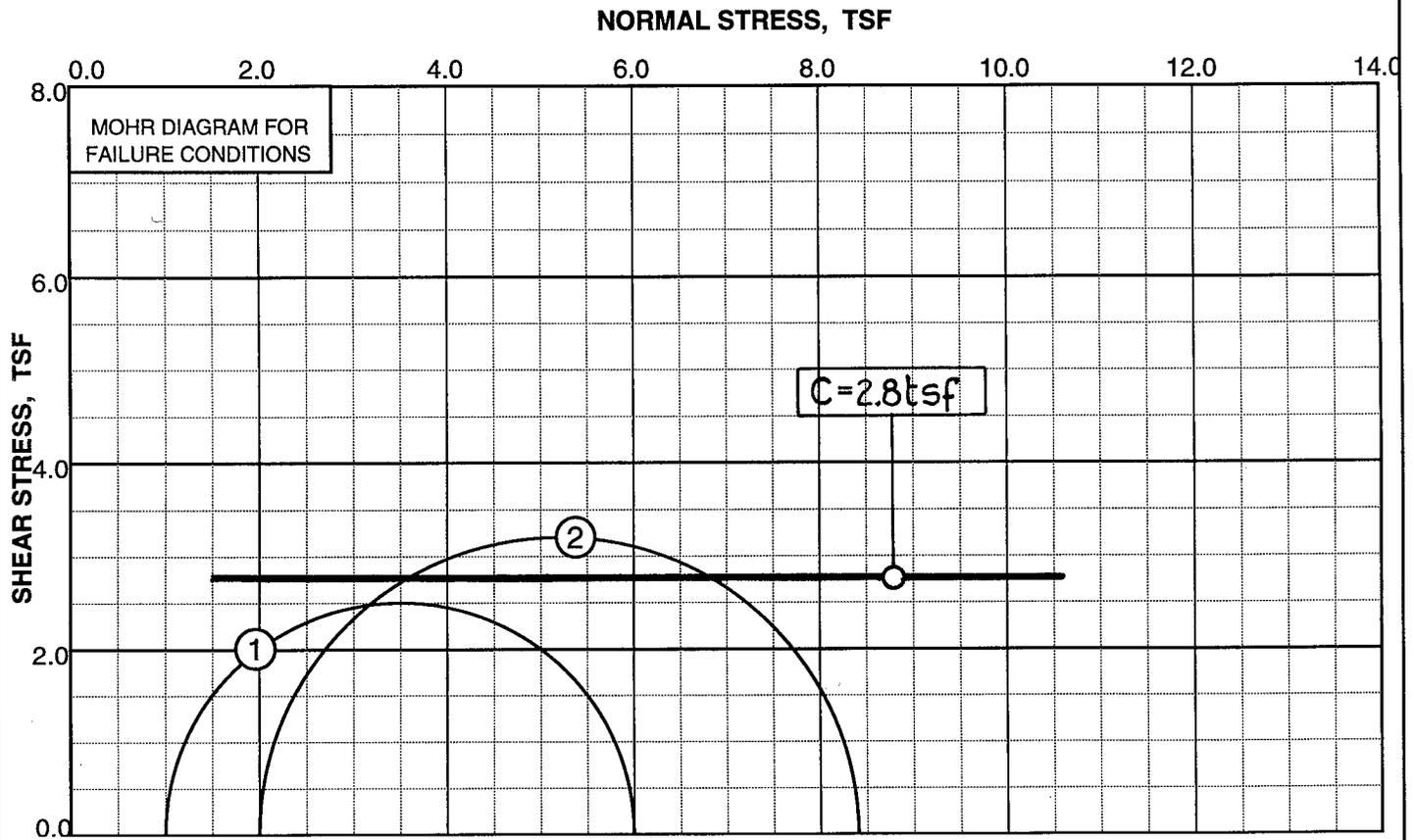
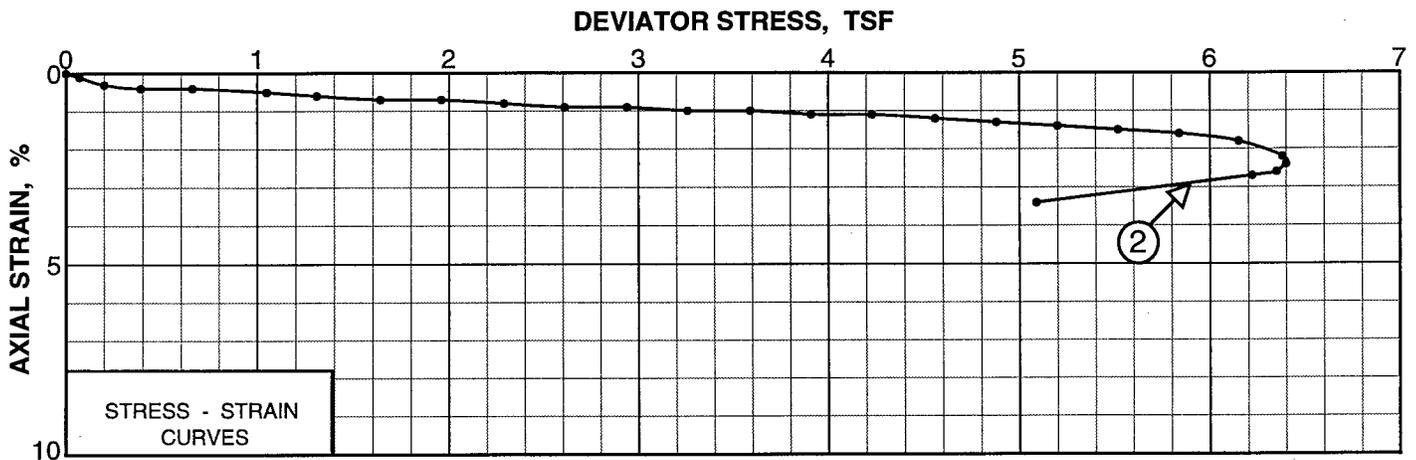
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANTS

MUESER RUTLEDGE CONSULTING ENGINEERS
708 THIRD AVENUE, NEW YORK, N.Y. 10017

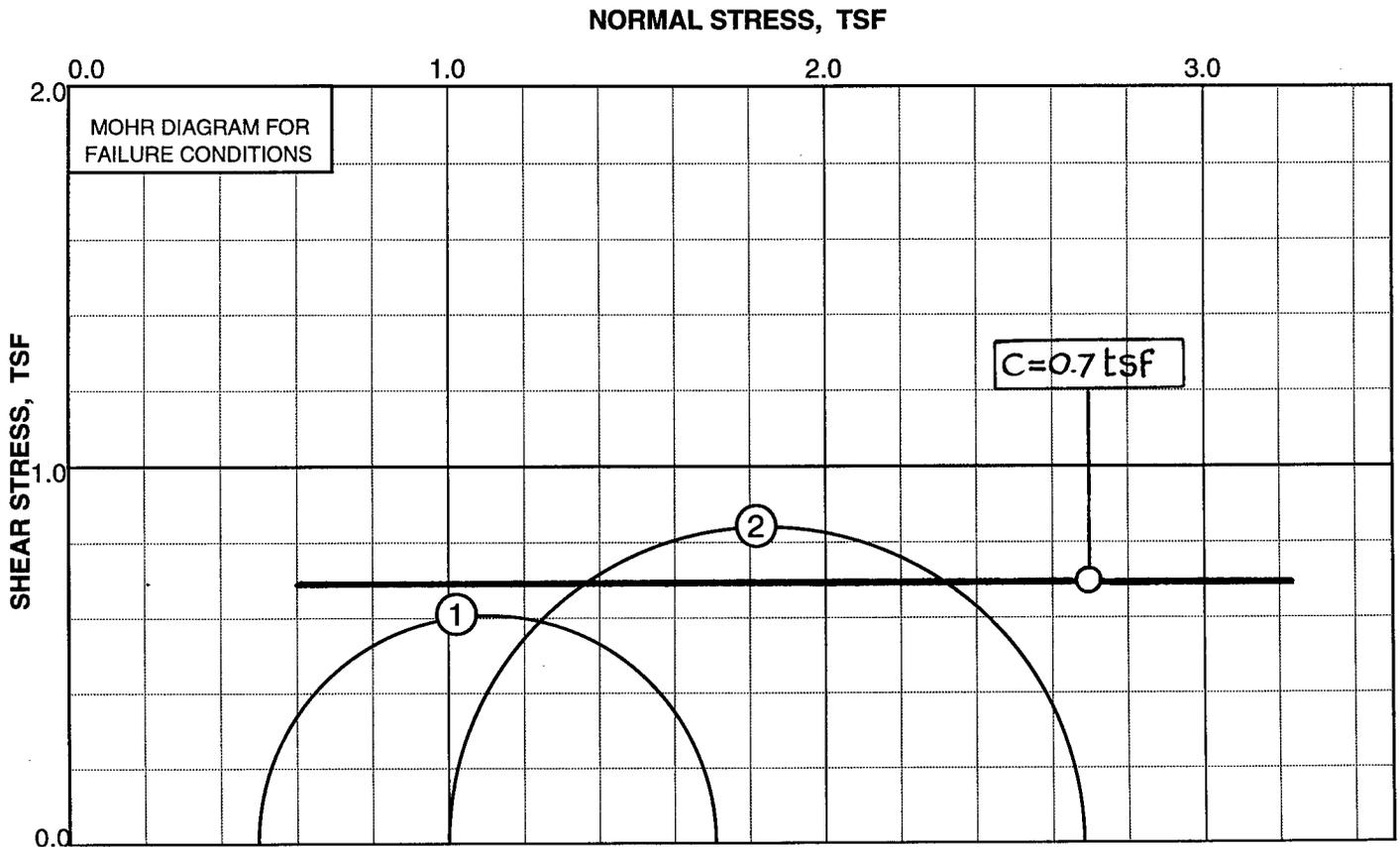
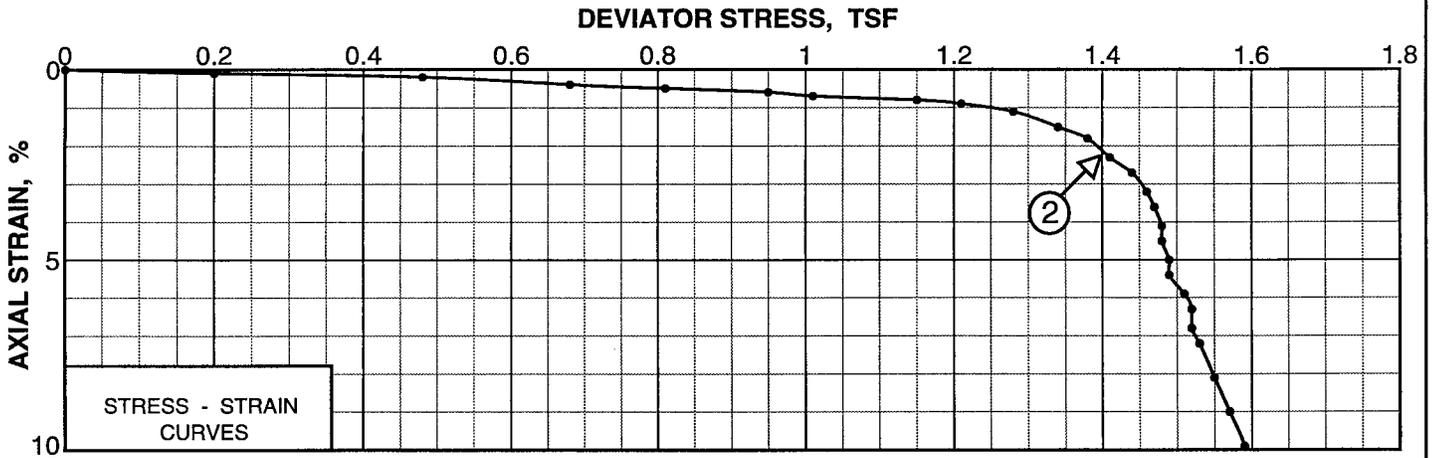
MADE BY: MC DATE: 11-25-97 FILE NO. 8737
CH'KD BY: AAA DATE: 11-25-97

SUMMARY OF STRENGTH TESTS PLATE NO. 9
BORING NO. YB-40U

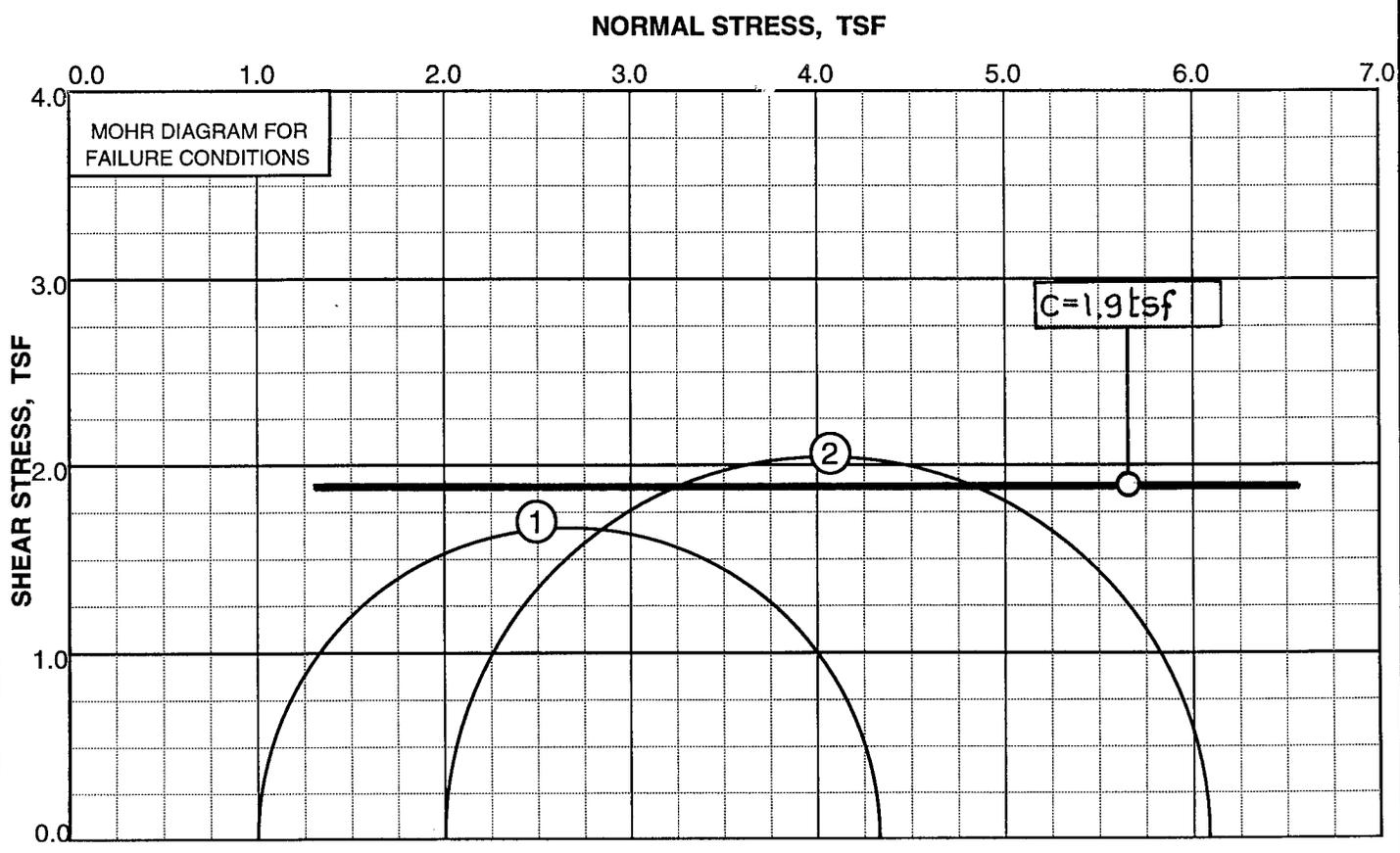
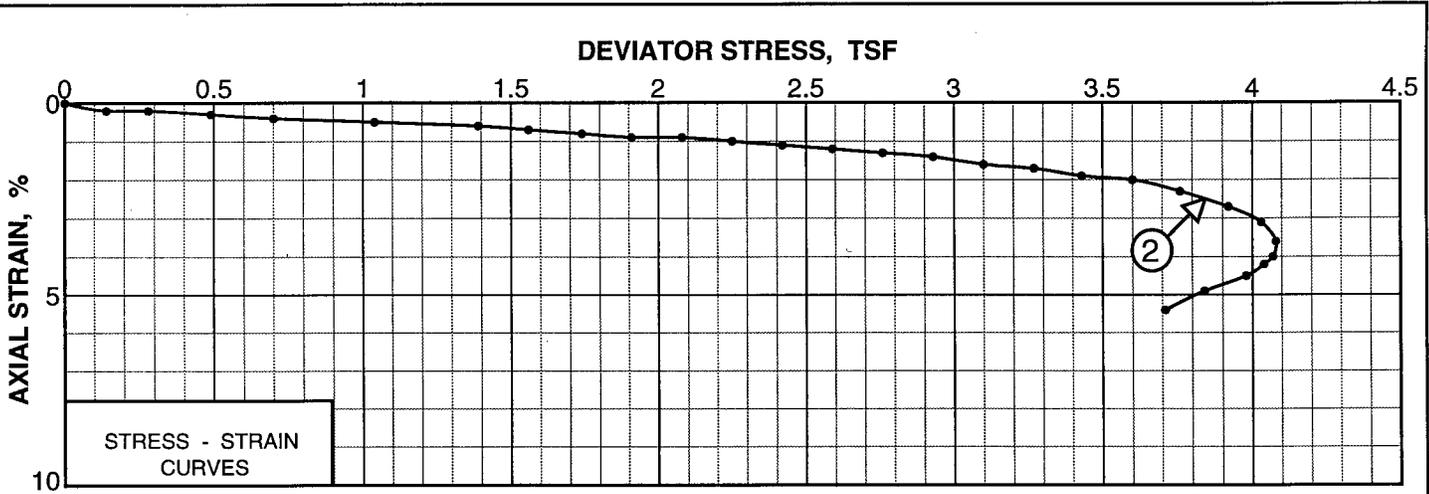
*SAMPLE FAILED ON SLICKENSIDED PLANE.



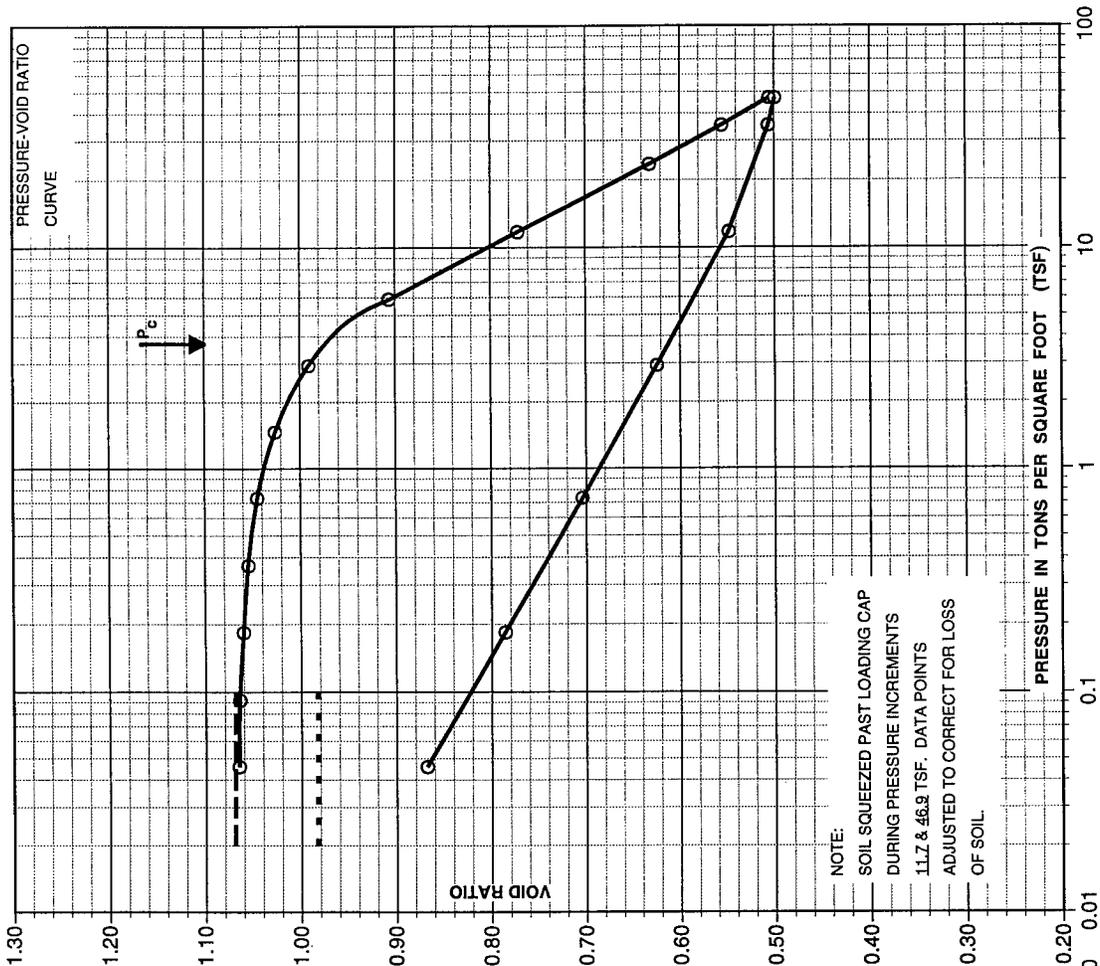
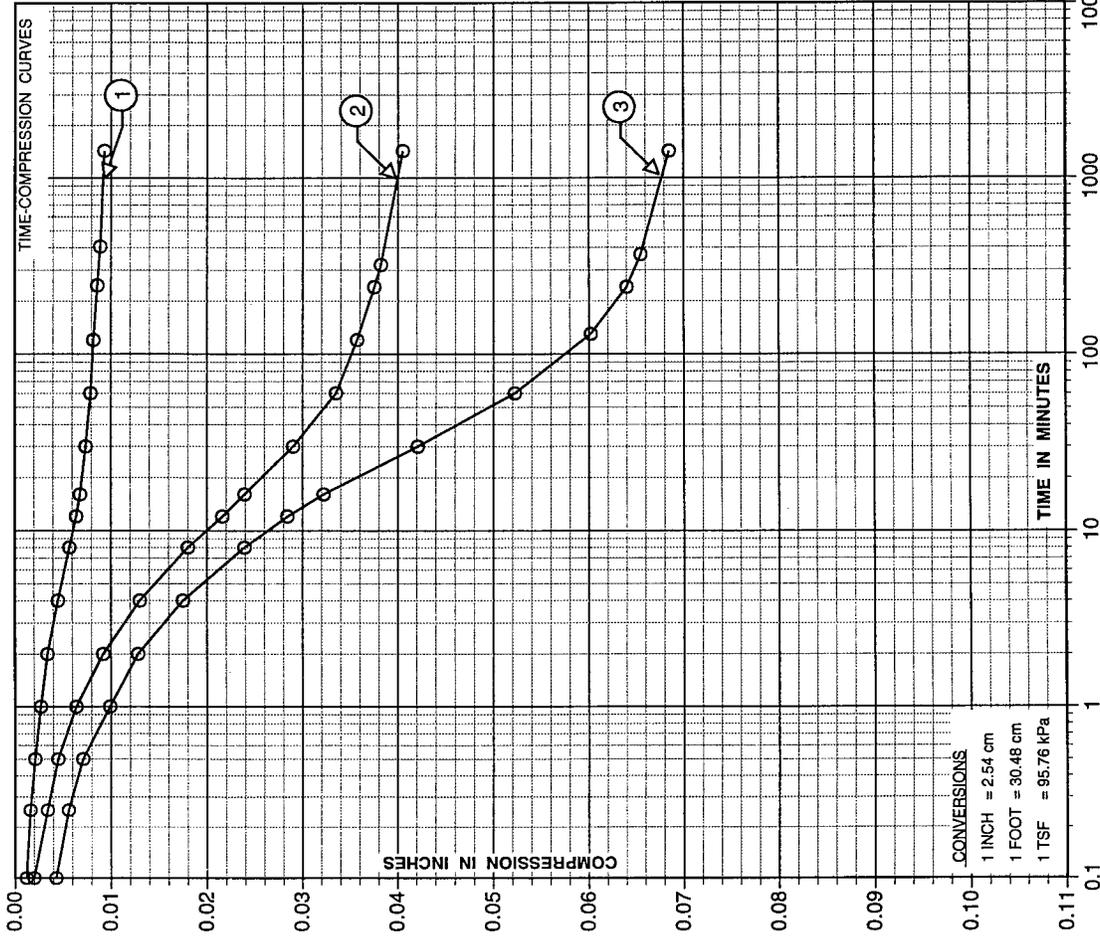
DESCRIPTION OF MATERIAL TESTED											SYMBOLS FOR TEST TYPES		
GRAY GREEN SLIGHTLY ORGANIC MICACEOUS SILTY FINE SAND, TRACE CLAY STRATUM (Ms)											Q- UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST		
KEY	BORING NO.	SAMPLE NO.	SOIL TYPE	TEST TYPE	LATERAL PRESSURE TSF	WATER CONTENT-%		DEGREE OF SATURATION-%		DEVIATOR STRESS TSF	AXIAL STRAIN %	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEUW, CATHER & COMPANY GENERAL ENGINEERING CONSULTANTS	
						INITIAL	FINAL	INITIAL	FINAL				
1	YB-40U	21U	SM-SC	Q	1.0	29	29			5.0	1.6		
2	YB-40U	21U	SM-SC	Q	2.0	28	29			6.41	2.4		
MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017											MADE BY: MC DATE: 11-18-97 FILE NO. 8737		
SUMMARY OF STRENGTH TESTS											CH'KD BY: AAA DATE: 11-18-97		
BORING NO. YB-40U											PLATE NO. 10		



DESCRIPTION OF MATERIAL TESTED										SYMBOLS FOR TEST TYPES	
GRAY SILTY FINE SAND, TRACE CLAY, CLAY POCKETS, MICA										Q- UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST	
STRATUM (Es)											
KEY	BORING NO.	SAMPLE NO.	SOIL TYPE	TEST TYPE	LATERAL PRESSURE TSF	WATER CONTENT-%		DEGREE OF SATURATION-%		DEVIATOR STRESS TSF	AXIAL STRAIN %
						INITIAL	FINAL	INITIAL	FINAL		
1	YB-48U	11U	SM-SC	Q	0.5	51	51			1.21	6.8
2	YB-48U	11U	SM-SC	Q	1.0	47	47			1.68	14.4
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEUW, CATHER & COMPANY GENERAL ENGINEERING CONSULTANTS										MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017	
MADE BY: MC								DATE: 11-25-97		FILE NO. 8737	
CH'KD BY: AAA								DATE: 11-25-97		SUMMARY OF STRENGTH TESTS	
BORING NO, YB-48U										PLATE NO. 11	

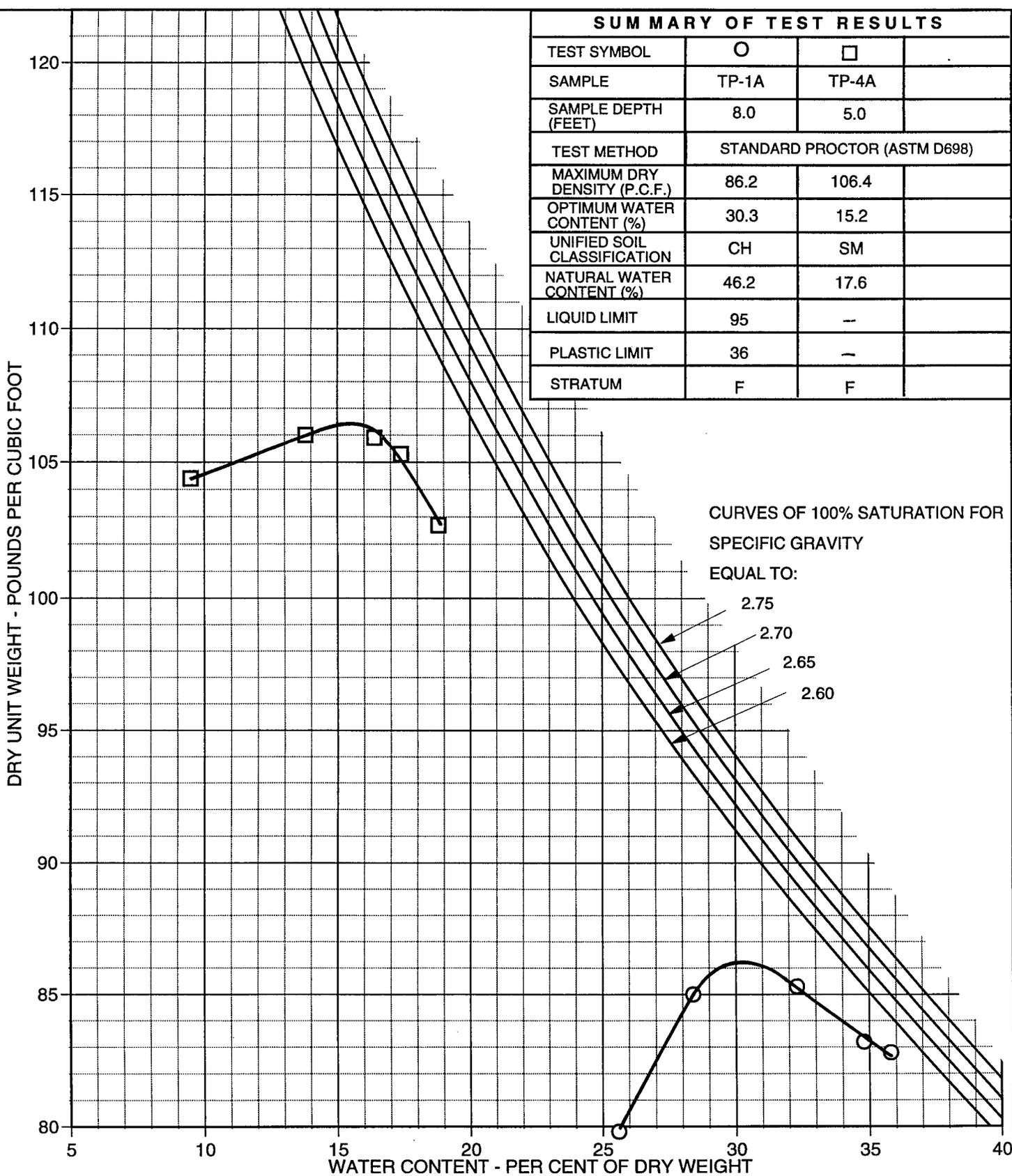


DESCRIPTION OF MATERIAL TESTED											SYMBOLS FOR TEST TYPES			
GRAY FINE SAND, SOME SILT, TRACE CLAY, GRAVEL											Q- UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST			
STRATUM (Es)														
KEY	BORING NO.	SAMPLE NO.	SOIL TYPE	TEST TYPE	LATERAL PRESSURE TSF	WATER CONTENT-%		DEGREE OF SATURATION-%		DEVIATOR STRESS TSF	AXIAL STRAIN %	WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEUW, CATHER & COMPANY GENERAL ENGINEERING CONSULTANTS		
						INITIAL	FINAL	INITIAL	FINAL					
1	YB-48U	13U	SM-SC	Q	1.0	36	35			3.33	2.1			
2	YB-48U	13U	SM-SC	Q	2.0	31	31			4.08	3.6			
MUESER RUTLEDGE CONSULTING ENGINEERS 708 THIRD AVENUE, NEW YORK, N.Y. 10017											MADE BY: MC		DATE: 11-18-97	FILE NO. 8737
SUMMARY OF STRENGTH TESTS											CH'KD BY: AAA		DATE: 11-18-97	PLATE NO. 12
BORING NO. YB-48U														



CURVE NO.		INCREMENT FROM (TSF) TO (TSF)		SPECIMEN DESCRIPTION: STIFF GRAY CLAY, TRACE FINE SAND (CH)		STRATUM		Ec	
1	0.733	1.47		ELEVATION OF SPECIMEN = 218.2		INITIAL VOID RATIO, $e_0 = 1.069$		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY	
2	2.93	5.86		DEPTH OF SPECIMEN (FT) = 29.7		FINAL VOID RATIO, $e_f = 0.982$		DeLUW, CATHER AND COMPANY	
3	11.7	23.4		DIAMETER OF SPECIMEN (IN) = 2.50		ESTIMATED PRECONSOLIDATION STRESS (TSF), $P_c = 4.6$		GENERAL ENGINEERING CONSULTANTS	
4				INITIAL THICKNESS OF SPECIMEN (IN) = 1.00		EXISTING OVERBURDEN STRESS (TSF), $P_0 = 1.4$		MUESER RUTLEDGE CONSULTING ENGINEERS	
5				INITIAL WATER CONTENT, % = 36.9		COMPRESSION INDEX, $C_c = 0.460$		708 THIRD AVENUE, NEW YORK, N.Y. 10017	
6				FINAL WATER CONTENT, % = 36.3		SWELLING INDEX, $C_s = 0.090$, REBOUND FROM $e = 0.499$		MADE BY: MC DATE: 11-18-97	
7				FINAL DEGREE SATURATION, % = 95.3				CHKD BY: CJM DATE: 11-18-97	
8				FINAL DEGREE SATURATION, % = 101.9				CONSOLIDATION TEST	
								BORING NO. YB-40U SAMPLE NO. 9U	
								PLATE NO. 13	
								FILE NO. 8737	
								PLATE NO. 13	

SUMMARY OF TEST RESULTS			
TEST SYMBOL	○	□	
SAMPLE	TP-1A	TP-4A	
SAMPLE DEPTH (FEET)	8.0	5.0	
TEST METHOD	STANDARD PROCTOR (ASTM D698)		
MAXIMUM DRY DENSITY (P.C.F.)	86.2	106.4	
OPTIMUM WATER CONTENT (%)	30.3	15.2	
UNIFIED SOIL CLASSIFICATION	CH	SM	
NATURAL WATER CONTENT (%)	46.2	17.6	
LIQUID LIMIT	95	—	
PLASTIC LIMIT	36	—	
STRATUM	F	F	



CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

- 2.75
- 2.70
- 2.65
- 2.60

DESCRIPTION OF TESTS

TEST METHODS	STANDARD PROCTOR	MODIFIED PROCTOR	HARVARD MINIATURE	MODIFIED PROCTOR 6 IN. MOLD
VOLUME OF CYLINDER (CU. FT.)	1/30	1/30	1/454	1/13.33
HAMMER WEIGHT (LBS.)	5 1/2	10	SPRING LB	10
HAMMER DROP (IN.)	12	18	—	18
HAMMER BLOWS PER LAYER	25	25	TAMPS	56
NUMBER OF LAYERS	3	5	—	5
COMPACTION ENERGY (FT. LBS. PER CU. FT.)	12,400	56,300	—	56,300

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 PARSONS DeLEUW, INC.
 GENERAL ENGINEERING CONSULTANTS

MUESER RUTLEDGE CONSULTING ENGINEERS
 708 THIRD AVENUE, NEW YORK, N.Y. 10017

SCALE	MADE BY: WEK	DATE: 12-16-97	FILE NO.
---	CH'KD BY: FW	DATE: 12-18-97	8737

COMPACTION DIAGRAM
 TEST PITS TP-1A AND TP-4A

PLATE NO.
 14

CBR TEST DATA

SYMBOL	○	□
TEST PIT NO.	TP-1A	TP-4A
CONDITION OF SAMPLE	SOAKED	SOAKED
SWELL IN % OF INITIAL HEIGHT	2.6	0.0
DRY DENSITY - PCF AT COMPACTION	84.7	110.5
DRY DENSITY - PCF AFTER SOAKING	81.1	110.8
WATER CONTENT - % AT COMPACTION	30.0	14.2
WATER CONTENT - % AFTER SOAKING	39.7	17.1
CALIFORNIA BEARING RATIO - %	4.3	12.5

PENETRATION RESISTANCE IN PSI

700.0

600.0

500.0

400.0

300.0

200.0

100.0

0.0

PENETRATION IN INCHES

0.6

0.5

0.4

0.3

0.2

0.1

0

NOTES:

1. FOR COMPACTION TEST DATA, SEE PLATE NO. 14
2. FOR GRAIN SIZE DISTRIBUTION CURVE, SEE PLATE NOS. 5 & 6.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
PARSONS DeLEUW, INC.
GENERAL ENGINEERING CONSULTANTS

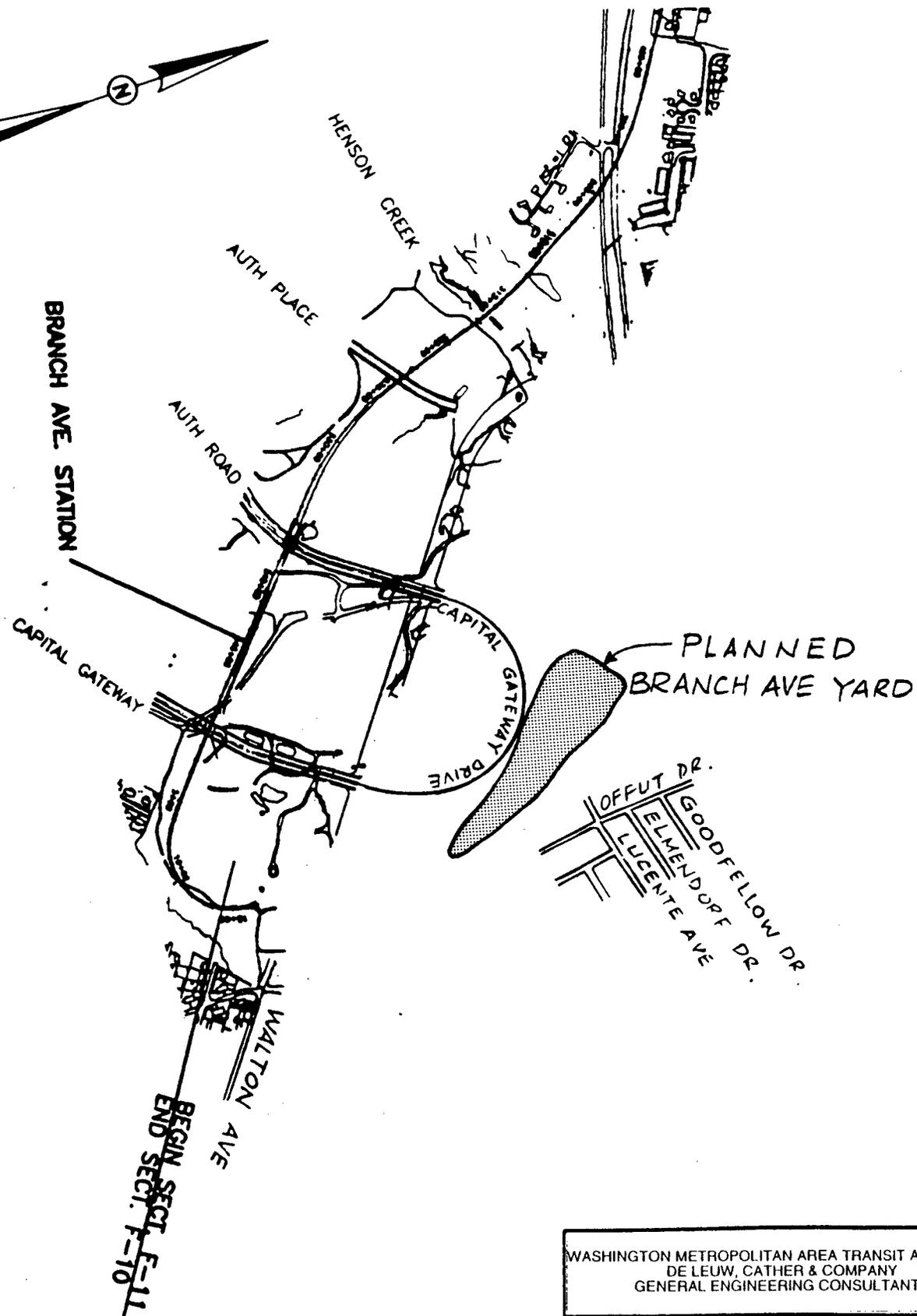
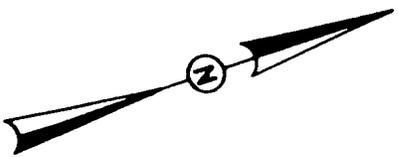
MUESER RUTLEDGE CONSULTING ENGINEERS
708 THIRD AVENUE, NEW YORK, NY 10017

MADE BY: WEK DATE: 12-16-97
CHKD BY: FW DATE: 12-18-97

FILE NO.
8737

CBR TEST RESULTS

PLATE NO.

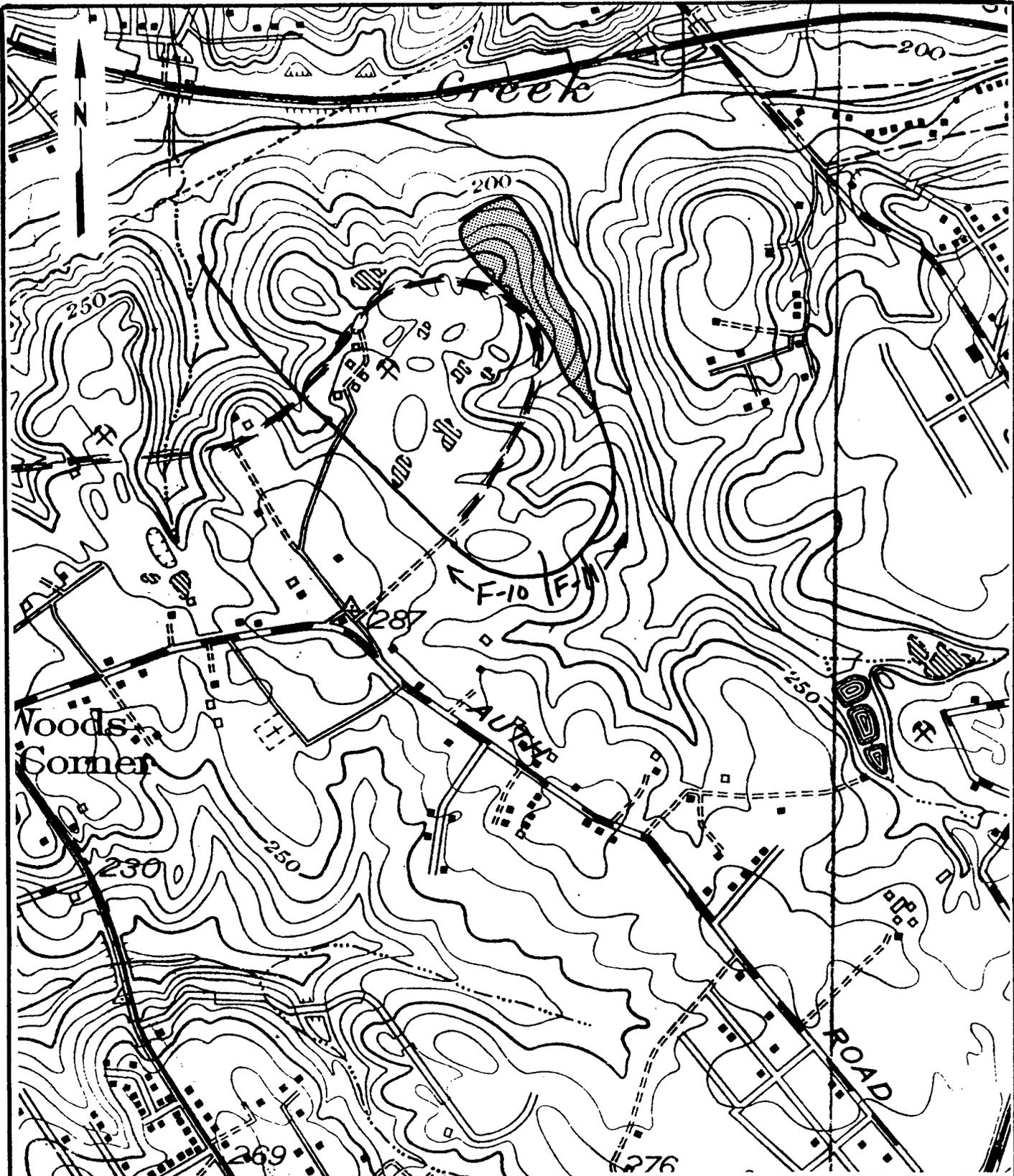


WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DE LEUW, CATHER & COMPANY
 GENERAL ENGINEERING CONSULTANTS

MUESER RUTLEDGE CONSULTING ENGINEERS
 708 THIRD AVENUE, NEW YORK, NY 10017

SCALE NTS	MADE BY A.O.	DATE 7-97	FILE NO. 8737
	CHECKED BY	DATE	DRAWING NO.

GENERAL LOCATION PLAN SK-1

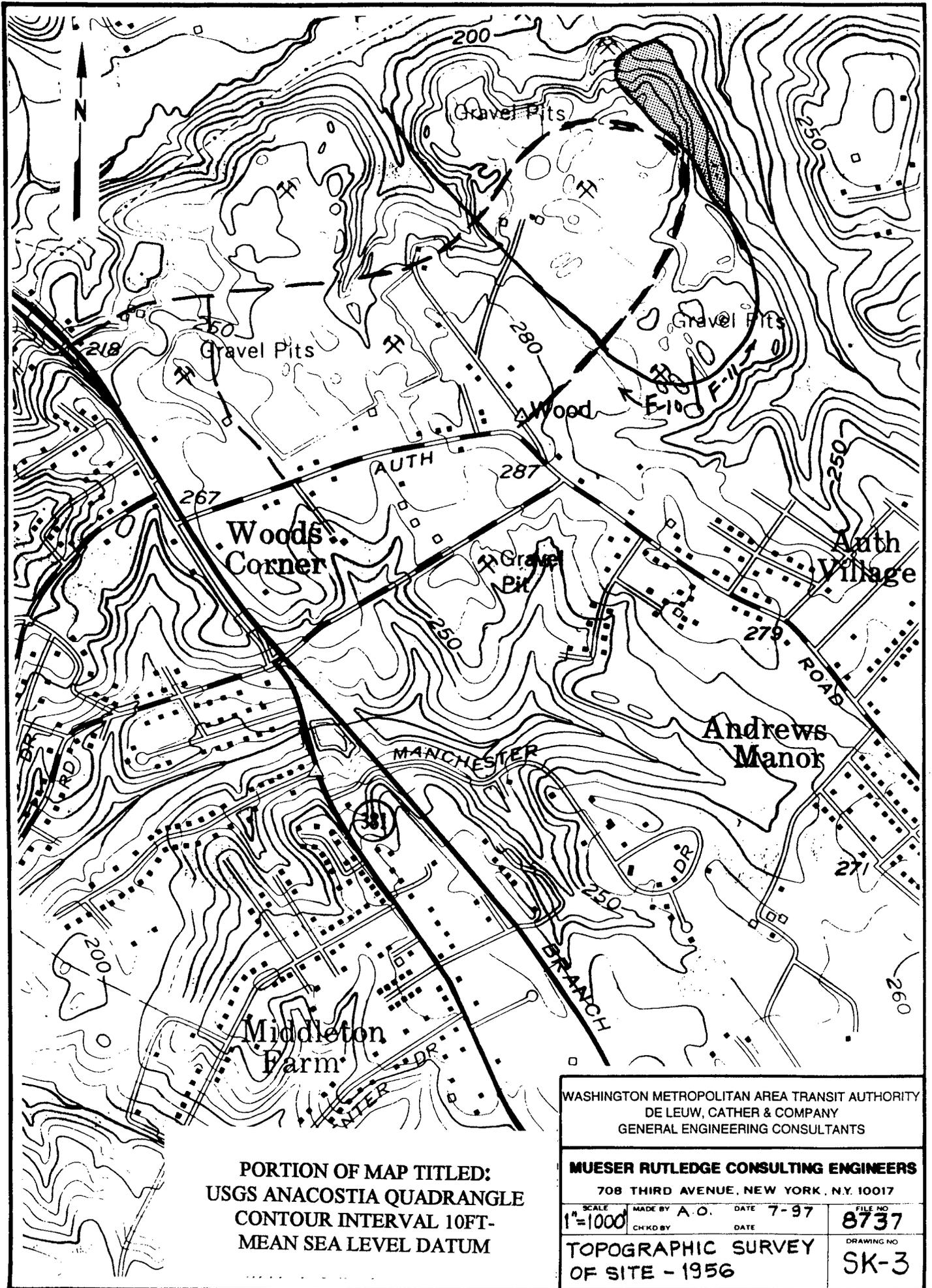


PORTION OF MAP TITLED:
 USGS ANACOSTIA QUADRANGLE
 CONTOUR INTERVAL 10FT-
 MEAN SEA LEVEL DATUM

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DE LEUW, CATHER & COMPANY
 GENERAL ENGINEERING CONSULTANTS

MUESER RUTLEDGE CONSULTING ENGINEERS
 708 THIRD AVENUE, NEW YORK, N.Y. 10017

SCALE 1"=1000'	MADE BY A.O.	DATE 7-97	FILE NO. 8737
	CHKD BY	DATE	DRAWING NO. SK-2
TOPOGRAPHIC SURVEY OF SITE - 1951			



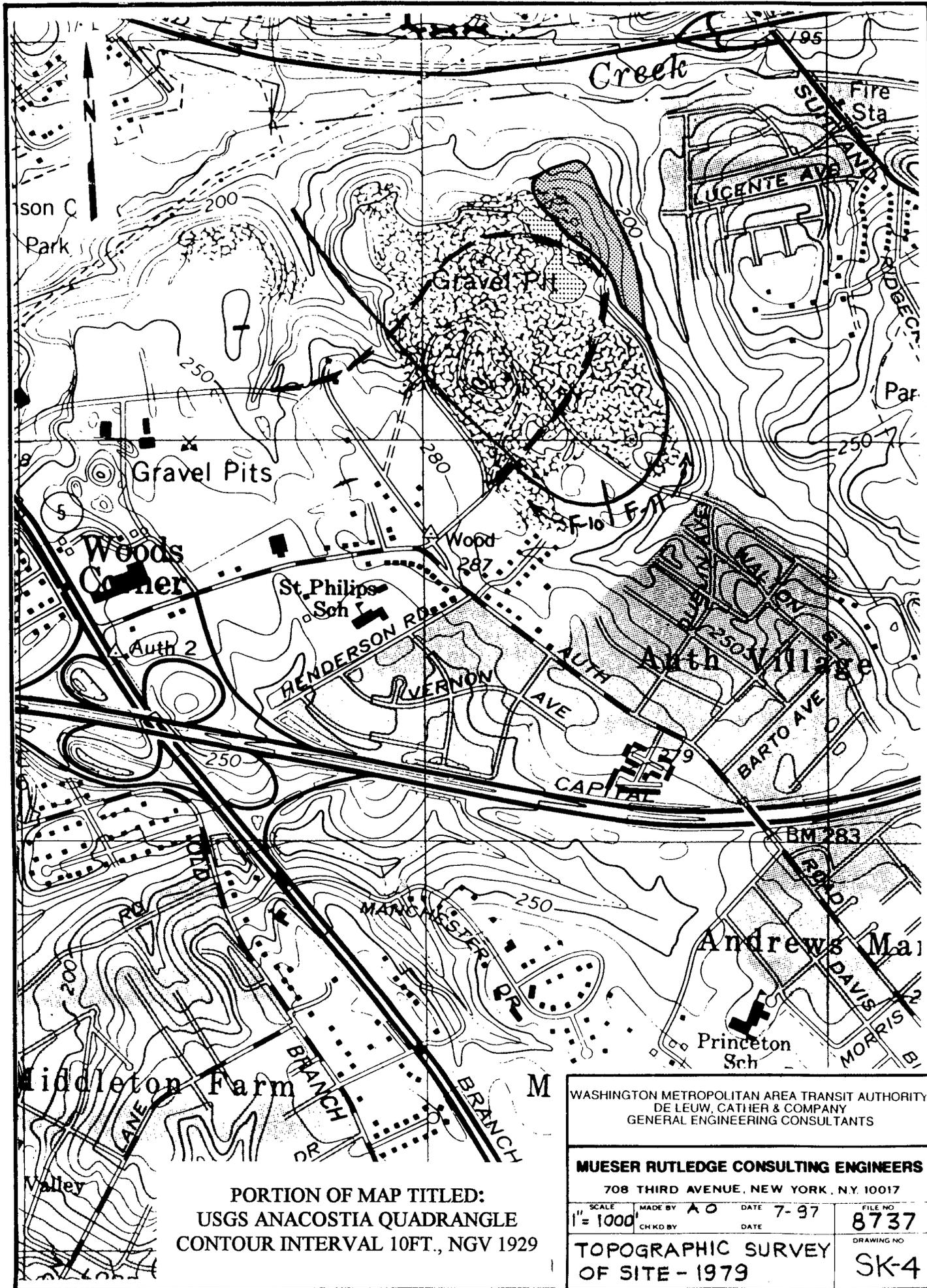
PORTION OF MAP TITLED:
 USGS ANACOSTIA QUADRANGLE
 CONTOUR INTERVAL 10FT-
 MEAN SEA LEVEL DATUM

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DE LEUW, CATHER & COMPANY
 GENERAL ENGINEERING CONSULTANTS

MUESER RUTLEDGE CONSULTING ENGINEERS

708 THIRD AVENUE, NEW YORK, N.Y. 10017

SCALE 1"=1000'	MADE BY A. O.	DATE 7-97	FILE NO 8737
CHKD BY	DATE		DRAWING NO SK-3
TOPOGRAPHIC SURVEY OF SITE - 1956			



PORTION OF MAP TITLED:
 USGS ANACOSTIA QUADRANGLE
 CONTOUR INTERVAL 10FT., NGV 1929

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
 DE LEUW, CATHER & COMPANY
 GENERAL ENGINEERING CONSULTANTS

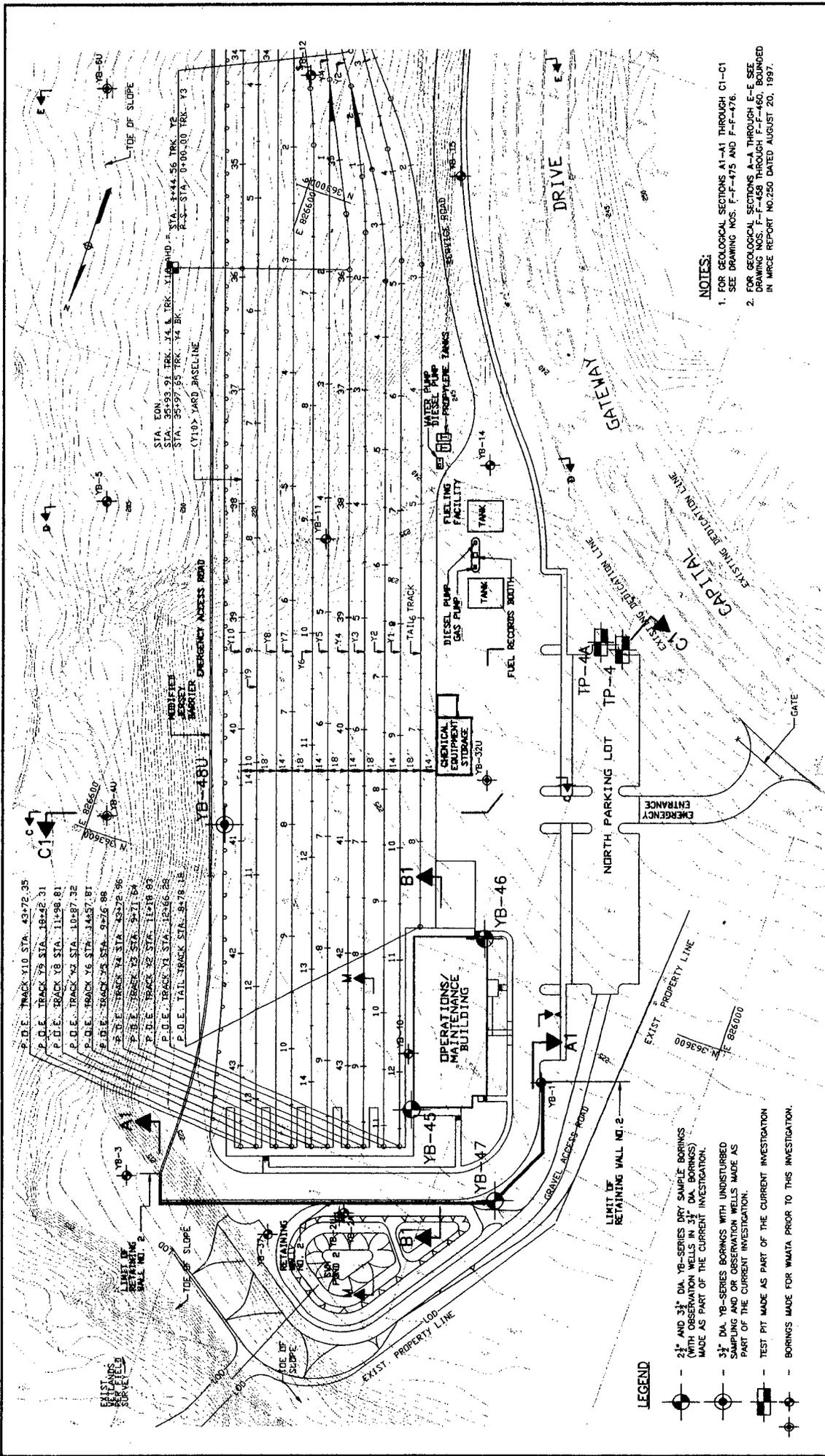
MUESER RUTLEDGE CONSULTING ENGINEERS

708 THIRD AVENUE, NEW YORK, N.Y. 10017

SCALE 1" = 1000'	MADE BY AO	DATE 7-97	FILE NO 8737
	CHK'D BY	DATE	DRAWING NO

TOPOGRAPHIC SURVEY
 OF SITE - 1979

SK-4



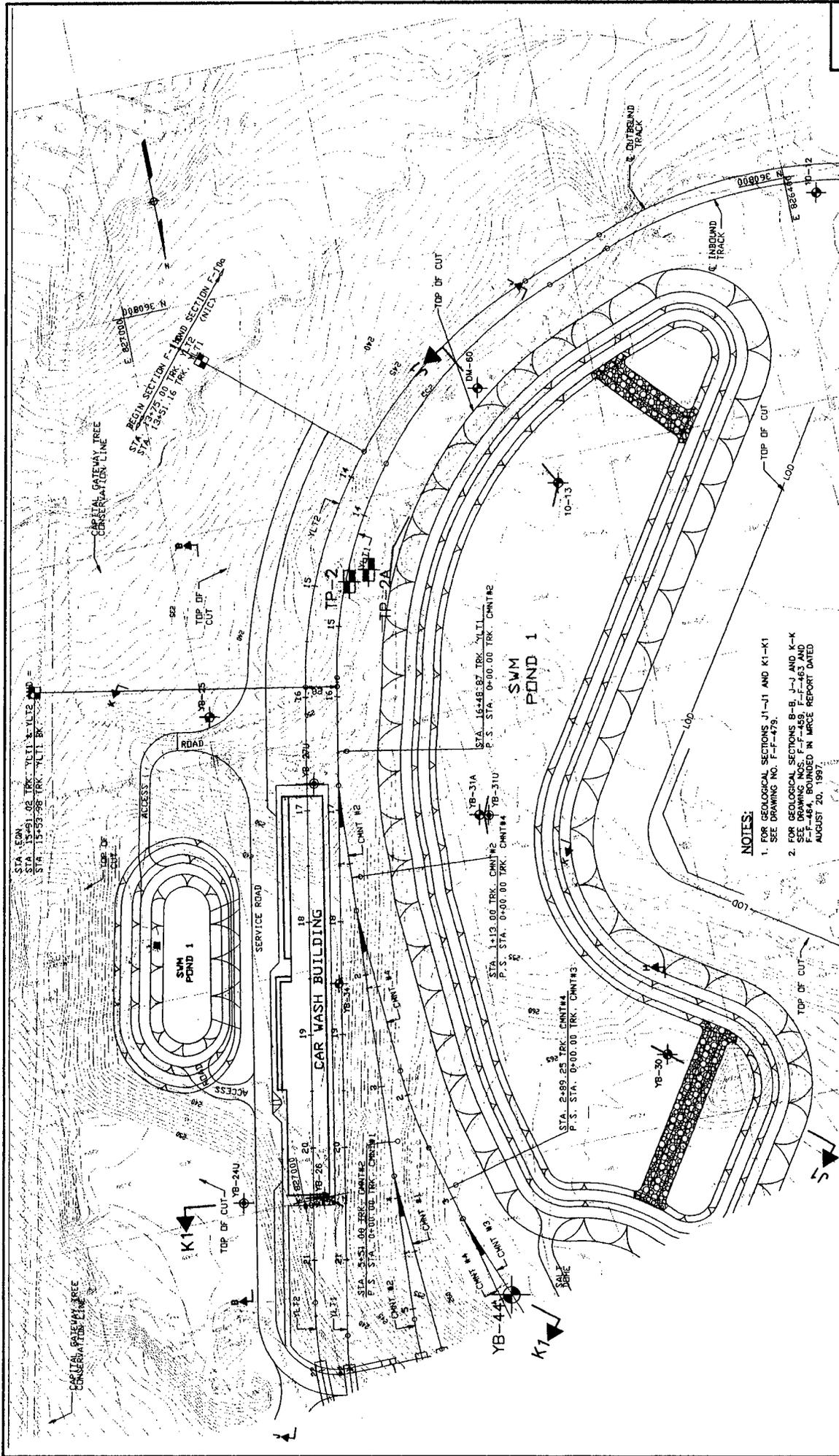
NOTES:

1. FOR GEOLOGICAL SECTIONS A1-A1 THROUGH C1-C1 SEE DRAWING NOS. F-F-475 AND F-F-476.
2. FOR GEOLOGICAL SECTIONS A-A THROUGH E-E SEE DRAWING NOS. F-F-475 THROUGH F-F-476. ENLARGED IN MRCE REPORT NO.250 DATED AUGUST 20, 1997.

LEGEND

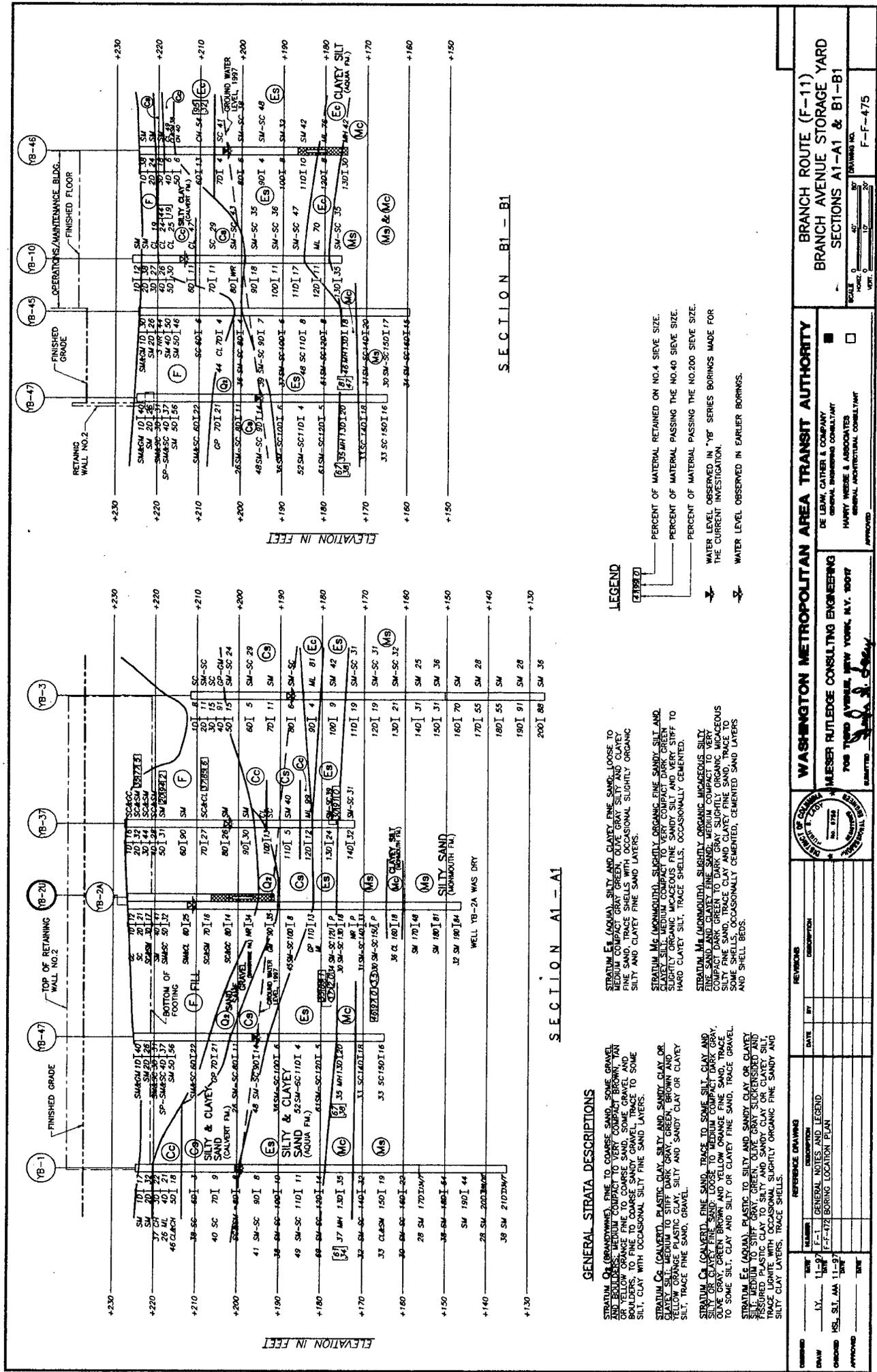
- 2" and 3" DA, YB-SERIES DRY SAMPLE BORINGS (WITH OBSERVATION WELLS IN 3" DA BORINGS) MADE AS PART OF THE CURRENT INVESTIGATION.
- 3" DA, YB-SERIES BORINGS WITH UNDISTURBED SAMPLING AND/OR OBSERVATION WELLS MADE AS PART OF THE CURRENT INVESTIGATION.
- TEST PIT MADE AS PART OF THE CURRENT INVESTIGATION.
- BORINGS MADE FOR WHATMA PRIOR TO THIS INVESTIGATION.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEW, CATHY & COMPANY GENERAL BUSINESS CONSULTANT HARRY WEESE & ASSOCIATES GENERAL ARCHITECTURAL CONSULTANT		BRANCH ROUTE (F-11) BRANCH AVENUE STORAGE YARD BORING LOCATION PLAN	
DRAWN BY: HSL CHECKED BY: HSL, AA DATE: 11-97	REFERENCE DRAWINGS: GENERAL NOTES AND LEGEND F-F-475 GEOLOGICAL SECTIONS F-F-476	DATE: 11-97 DATE: 11-97	REVISIONS: NO. 1 DESCRIPTION:
APPROVED: [Signature] DATE:	SUBMITTED: [Signature] DATE:	SCALE: 0' 20' 40' DRAWING NO. F-F-472	APPROVED: [Signature] DATE:



NOTES:
 1. FOR GEOLOGICAL SECTIONS J1-J1 AND K1-K1 SEE DRAWING NO. F-F-479.
 2. FOR GEOLOGICAL SECTIONS B-B, J-J AND K-K SEE DRAWING NOS. F-F-459, F-F-463 AND F-F-464, BOUNDED IN MRCE REPORT DATED AUGUST 20, 1997.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEIN, CATER & COMPANY GENERAL ENGINEERING CONSULTANT HARRY WESSE & ASSOCIATES GENERAL ARCHITECTURAL CONSULTANT APPROVED		BRANCH ROUTE (F-11) BRANCH AVENUE STORAGE YARD BORING LOCATION PLAN	
MESSER RUTLEDGE CONSULTING ENGINEERING 708 THIRD AVENUE, NEW YORK, N.Y. 10017 SUBMITTED: <i>[Signature]</i>		SCALE: 0' 40' 80' DRAWING NO. F-F-474	
REVISIONS NO. DATE DESCRIPTION	REFERENCE DRAWING NO. NUMBER DESCRIPTION	DESIGNED: _____ DATE: _____ DRAWN: _____ DATE: _____ CHECKED: _____ DATE: _____ APPROVED: _____ DATE: _____	GENERAL NOTES AND LEGEND F-11 F-11-1 F-11-2 F-11-3 F-11-4 F-11-5 F-11-6 F-11-7 F-11-8 F-11-9 F-11-10 F-11-11 F-11-12 F-11-13 F-11-14 F-11-15 F-11-16 F-11-17 F-11-18 F-11-19 F-11-20 F-11-21 F-11-22 F-11-23 F-11-24 F-11-25 F-11-26 F-11-27 F-11-28 F-11-29 F-11-30 F-11-31 F-11-32 F-11-33 F-11-34 F-11-35 F-11-36 F-11-37 F-11-38 F-11-39 F-11-40 F-11-41 F-11-42 F-11-43 F-11-44 F-11-45 F-11-46 F-11-47 F-11-48 F-11-49 F-11-50 F-11-51 F-11-52 F-11-53 F-11-54 F-11-55 F-11-56 F-11-57 F-11-58 F-11-59 F-11-60 F-11-61 F-11-62 F-11-63 F-11-64 F-11-65 F-11-66 F-11-67 F-11-68 F-11-69 F-11-70 F-11-71 F-11-72 F-11-73 F-11-74 F-11-75 F-11-76 F-11-77 F-11-78 F-11-79 F-11-80 F-11-81 F-11-82 F-11-83 F-11-84 F-11-85 F-11-86 F-11-87 F-11-88 F-11-89 F-11-90 F-11-91 F-11-92 F-11-93 F-11-94 F-11-95 F-11-96 F-11-97 F-11-98 F-11-99 F-11-100



SECTION A1-1

SECTION B1-1

GENERAL STRATA DESCRIPTIONS

STRATUM O₁ (BRANDYWINE), FINE TO COARSE SAND, SOME GRAVEL AND Boulders, MEDIUM COMPACT TO VERY COMPACT BROWN, TAN AND GRAY SAND, FINE TO COARSE SANDY GRAIN, TRACE TO SOME SILTY, CLAY WITH OCCASIONAL SILTY FINE SAND LAYERS.

STRATUM C₂ (CALVERT), PLASTIC CLAY, SILTY AND SANDY CLAY OR SILTY SAND, TRACE TO SILTY SAND, BROWN AND YELLOW ORANGE PLASTIC CLAY SILTY AND SANDY CLAY ON CLAYEY SILT, TRACE FINE SAND, GRAVEL.

STRATUM C₃ (CALVERT), FINE SAND, TRACE TO SOME SILTY CLAY AND SILTY SAND, MEDIUM TO MEDIUM COMPACT DARK GRAY, OLIVE GRAY SAND, FINE TO MEDIUM SAND, TRACE TO SOME SILTY, CLAY AND SILTY OR CLAYEY FINE SAND, TRACE GRAVEL.

STRATUM E₁ (AQUA), PLASTIC TO SILTY AND SANDY CLAY OR CLAYEY SILTY SAND, TRACE TO SILTY SAND, BROWN AND YELLOW ORANGE PLASTIC CLAY TO SILTY AND SANDY CLAY OR CLAYEY SILTY CLAY LAYERS, TRACE SHELLS.

STRATUM E₂ (AQUA), SILTY AND CLAYEY FINE SAND, LOOSE TO MEDIUM COMPACT GRAY GREEN, OLIVE GRAY SILTY AND CLAYEY FINE SAND, TRACE SHELLS WITH OCCASIONAL SLIGHTLY ORGANIC SILTY AND CLAYEY FINE SAND LAYERS.

STRATUM M₁ (MONROVIA), SLIGHTLY ORGANIC MUCKEUS SILTY CLAYEY SILT, MEDIUM COMPACT TO VERY COMPACT DARK GREEN TO SLIGHTLY ORGANIC MUCKEUS FINE SANDY SILT AND VERY STIFF TO HARD CLAYEY SILT, TRACE SHELLS, OCCASIONALLY CEMENTED.

STRATUM M₂ (MONROVIA), SLIGHTLY ORGANIC MUCKEUS SILTY FINE SAND AND CLAYEY FINE SAND, MEDIUM COMPACT TO VERY COMPACT DARK GREEN TO DARK GRAY SLIGHTLY ORGANIC MUCKEUS SILTY FINE SAND, TRACE CLAY AND CLAYEY FINE SAND, TRACE TO SOME SHELLS, OCCASIONALLY CEMENTED, CEMENTED SAND LAYERS AND SHELL BEDS.

LEGEND

(Boring) PERCENT OF MATERIAL RETAINED ON NO. 4 SIEVE SIZE.

(Boring) PERCENT OF MATERIAL PASSING THE NO. 40 SIEVE SIZE.

(Boring) PERCENT OF MATERIAL PASSING THE NO. 200 SIEVE SIZE.

Water Level Observed in "B" Series Borings Made for the Current Investigation.

Water Level Observed in Earlier Borings.

NO.	DATE	REVISIONS
1	11-27-57	GENERAL NOTES AND LEGEND
2	1-11-58	(F-F-17) BORING LOCATION PLAN

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

DE LEW, CATER & COMPANY
GENERAL ENGINEERING CONSULTANT

HARRY WEISSE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT

FOR TOWN AVENUE, NEW YORK, N.Y. 10017

DATE: 11-27-57

BY: [Signature]

BRANCH ROUTE (F-11)

BRANCH AVENUE STORAGE YARD

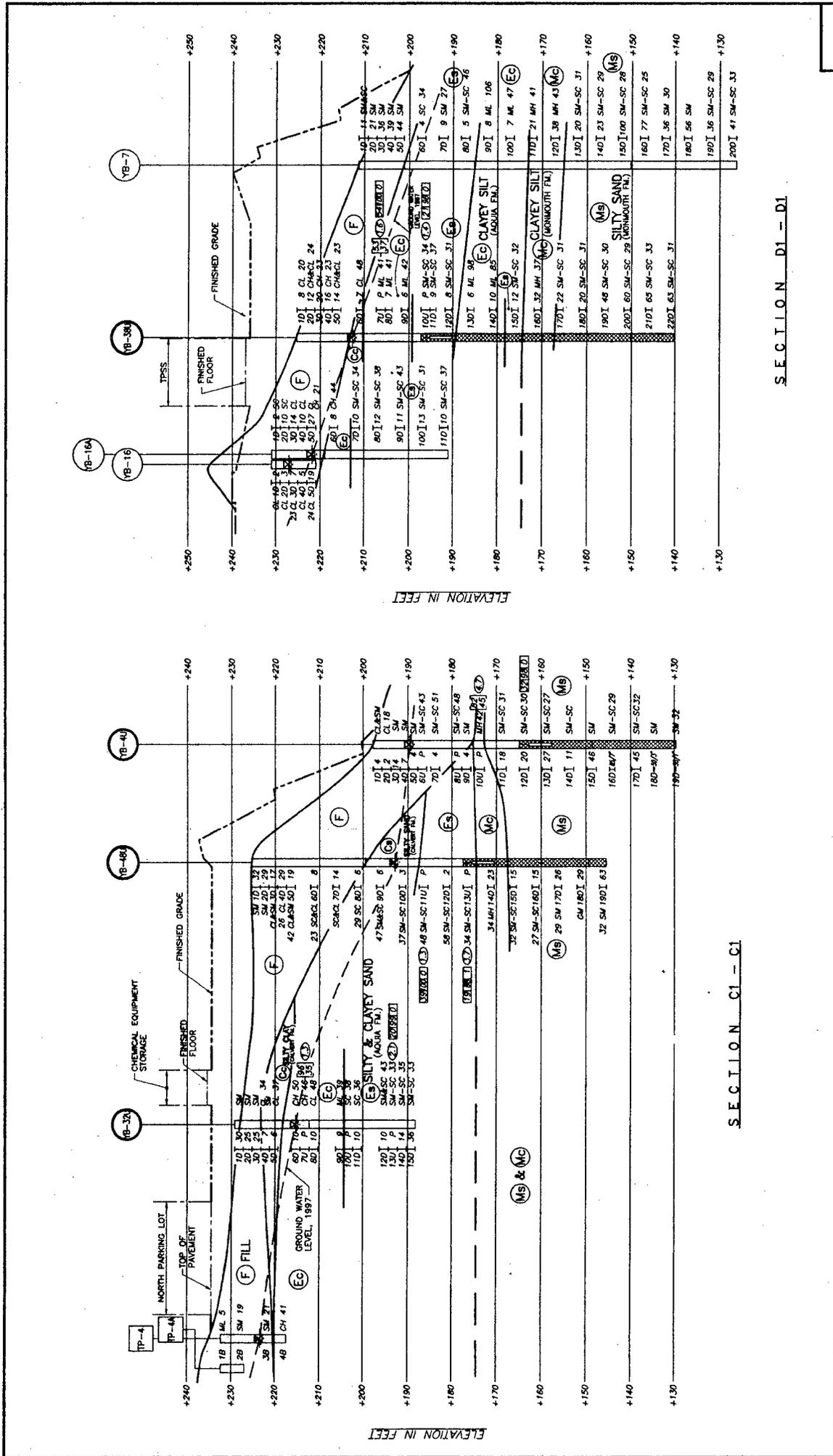
SECTIONS A1-1 & B1-1

SCALE: 1" = 10'-0"

DATE: 11-27-57

BY: [Signature]

APP. NO. F-F-475



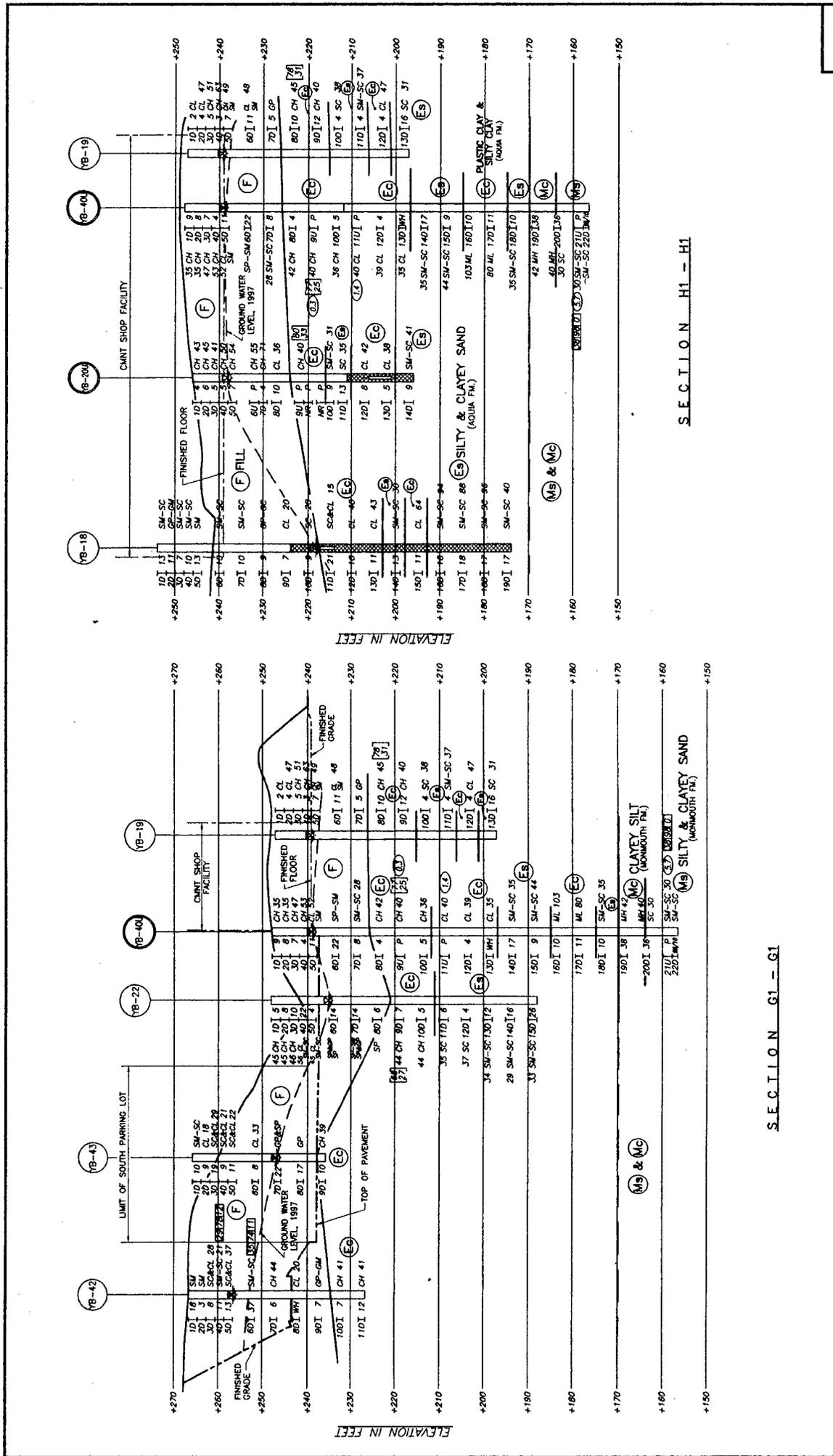
ELEVATION IN FEET

ELEVATION IN FEET

SECTION C1 - C1

SECTION D1 - D1

DESIGNED BY: <u> </u> DATE: <u> </u>		REFERENCE DRAWING NUMBER: <u> </u> DESCRIPTION: <u> </u>	
DRAWN BY: <u> </u> DATE: <u> </u>		GENERAL NOTES, LEGEND AND DIMENSIONS: <u> </u>	
CHECKED BY: <u> </u> DATE: <u> </u>		BORING LOCATION PLAN AND: <u> </u>	
APPROVED BY: <u> </u> DATE: <u> </u>		F-1-473	
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEHN, CATHER & COMPANY GENERAL BUSINESS CONSULTANT HARRY WEISSE & ASSOCIATES GENERAL ARCHITECTURAL CONSULTANT			
MESSER RUTLEDGE CONSULTING ENGINEERING 708 THIRD AVENUE, NEW YORK, N.Y. 10017			
BRANCH ROUTE (F-11) SECTIONS C1-C1 & D1-D1			
SCALE: HORIZ. 1" = 20' VERT. 1" = 10'		DRAWN BY: <u> </u> DATE: <u> </u>	
APPROVED BY: <u> </u> DATE: <u> </u>		F-F-476	



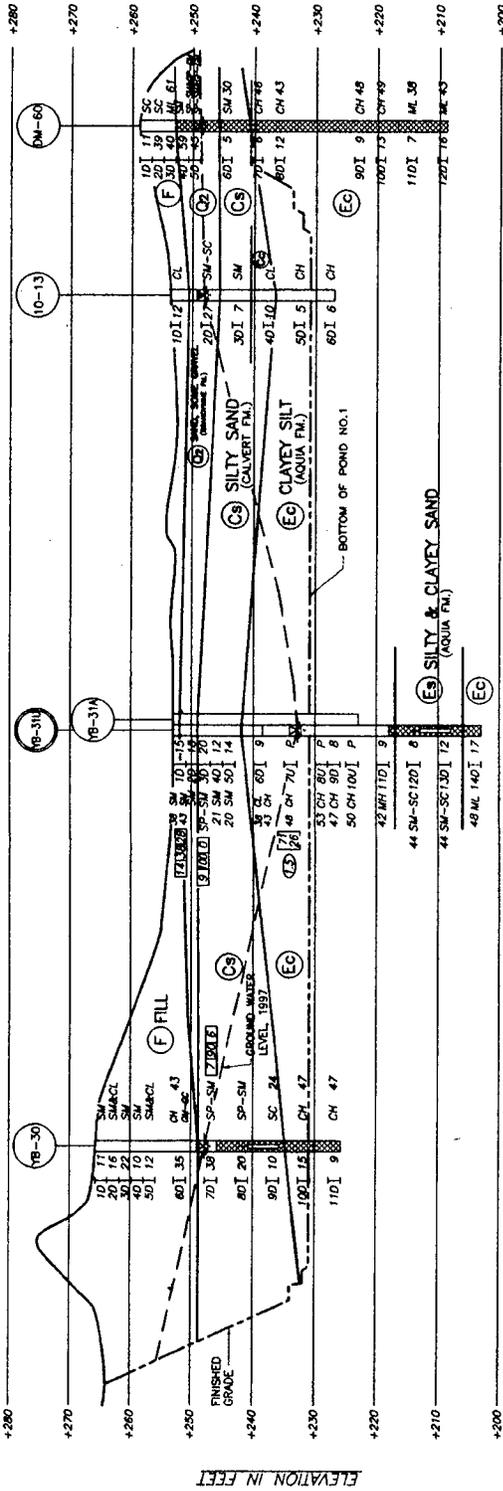
ELEVATION IN FEET

ELEVATION IN FEET

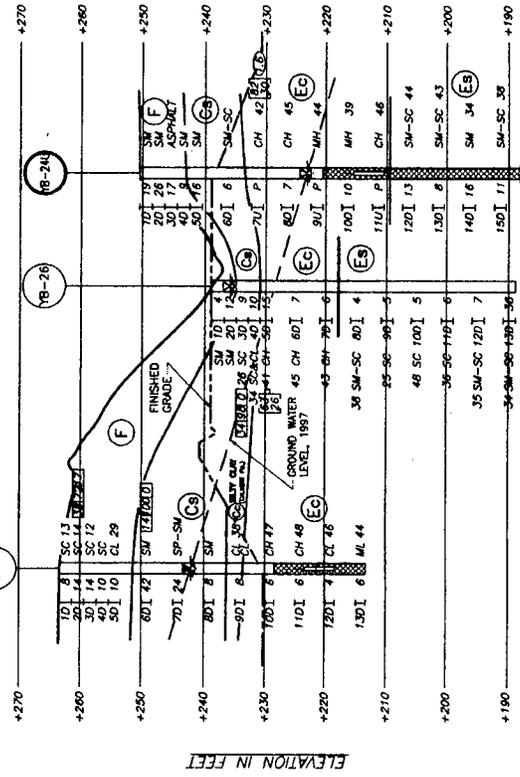
SECTION H1 - H1

SECTION G1 - G1

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEINA, CATHEN & COMPANY GENERAL ENGINEERING CONSULTANT HARRY WEISSE & ASSOCIATES GENERAL ARCHITECTURAL CONSULTANT		BRANCH ROUTE (F-11) BRANCH AVENUE STORAGE YARD SECTIONS G1-G1 & H1-H1													
DRAWN: 11-97 CHECKED: HSL, S.L. AA DATE: 11-97 SCALE: HORIZ. 1" = 20' VERT. 1" = 20' SHEET NO. 17 TOTAL SHEETS 20 F-F-478		REVISIONS <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		NO.	DATE	DESCRIPTION									
NO.	DATE	DESCRIPTION													
REFERENCE DRAWINGS <table border="1"> <thead> <tr> <th>NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>F-1 & F-2</td> <td>GENERAL NOTES, LEGEND AND GENERAL STRATA DESCRIPTIONS</td> </tr> <tr> <td>F-3 & F-4</td> <td>GENERAL STRATA DESCRIPTIONS</td> </tr> <tr> <td>F-5 & F-6</td> <td>BORING LOCATION PLAN</td> </tr> </tbody> </table>		NO.	DESCRIPTION	F-1 & F-2	GENERAL NOTES, LEGEND AND GENERAL STRATA DESCRIPTIONS	F-3 & F-4	GENERAL STRATA DESCRIPTIONS	F-5 & F-6	BORING LOCATION PLAN	APPROVED: _____ DATE: _____					
NO.	DESCRIPTION														
F-1 & F-2	GENERAL NOTES, LEGEND AND GENERAL STRATA DESCRIPTIONS														
F-3 & F-4	GENERAL STRATA DESCRIPTIONS														
F-5 & F-6	BORING LOCATION PLAN														



SECTION J1 - J1



SECTION K1 - K1

DESIGNED: DATE: 11-27-97		REFERENCE DRAWING: DATE: BY: DESCRIPTION:			WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEON, CATHER I COMPANY GENERAL GEOTECHNICAL CONSULTANT HARRY WEISZ & ASSOCIATES GENERAL ARCHITECTURAL CONSULTANT 708 THIRD AVENUE, NEW YORK, N.Y. 10017 APPROVED: <i>[Signature]</i>	BRANCH ROUTE (F-11) BRANCH AVENUE STORAGE YARD SECTIONS J1-J1 & K1-K1 SCALE: HORIZ. 1" = 40' VERT. 1" = 20' DRAWING NO. F-F-479
DRAWN: DATE: 11-27-97	CHECKED: DATE: 11-27-97	APPROVED: DATE:	REVISIONS:			

BORING NUMBER YB-38U
Ground surface elevation +225.3

0	10	5.0, 5.3, 5.3	10	32.3, 3.4	10	32.3, 3.4	10	32.3, 3.4
5	15	5.4, 8.0	15	32.3, 3.4	15	32.3, 3.4	15	32.3, 3.4
10	20	5.4, 12.1	20	32.3, 3.4	20	32.3, 3.4	20	32.3, 3.4
15	25	5.4, 10.1	25	32.3, 3.4	25	32.3, 3.4	25	32.3, 3.4
20	30	5.4, 10.1	30	32.3, 3.4	30	32.3, 3.4	30	32.3, 3.4
25	35	5.4, 10.1	35	32.3, 3.4	35	32.3, 3.4	35	32.3, 3.4
30	40	5.4, 10.1	40	32.3, 3.4	40	32.3, 3.4	40	32.3, 3.4
35	45	5.4, 10.1	45	32.3, 3.4	45	32.3, 3.4	45	32.3, 3.4
40	50	5.4, 10.1	50	32.3, 3.4	50	32.3, 3.4	50	32.3, 3.4
45	55	5.4, 10.1	55	32.3, 3.4	55	32.3, 3.4	55	32.3, 3.4
50	60	5.4, 10.1	60	32.3, 3.4	60	32.3, 3.4	60	32.3, 3.4
55	65	5.4, 10.1	65	32.3, 3.4	65	32.3, 3.4	65	32.3, 3.4
60	70	5.4, 10.1	70	32.3, 3.4	70	32.3, 3.4	70	32.3, 3.4
65	75	5.4, 10.1	75	32.3, 3.4	75	32.3, 3.4	75	32.3, 3.4
70	80	5.4, 10.1	80	32.3, 3.4	80	32.3, 3.4	80	32.3, 3.4
75	85	5.4, 10.1	85	32.3, 3.4	85	32.3, 3.4	85	32.3, 3.4

BORING NUMBER YB-39
Ground surface elevation +253.8

0	10	32.3, 3.4	10	32.3, 3.4	10	32.3, 3.4	10	32.3, 3.4
5	15	32.3, 3.4	15	32.3, 3.4	15	32.3, 3.4	15	32.3, 3.4
10	20	32.3, 3.4	20	32.3, 3.4	20	32.3, 3.4	20	32.3, 3.4
15	25	32.3, 3.4	25	32.3, 3.4	25	32.3, 3.4	25	32.3, 3.4
20	30	32.3, 3.4	30	32.3, 3.4	30	32.3, 3.4	30	32.3, 3.4
25	35	32.3, 3.4	35	32.3, 3.4	35	32.3, 3.4	35	32.3, 3.4
30	40	32.3, 3.4	40	32.3, 3.4	40	32.3, 3.4	40	32.3, 3.4
35	45	32.3, 3.4	45	32.3, 3.4	45	32.3, 3.4	45	32.3, 3.4
40	50	32.3, 3.4	50	32.3, 3.4	50	32.3, 3.4	50	32.3, 3.4
45	55	32.3, 3.4	55	32.3, 3.4	55	32.3, 3.4	55	32.3, 3.4
50	60	32.3, 3.4	60	32.3, 3.4	60	32.3, 3.4	60	32.3, 3.4
55	65	32.3, 3.4	65	32.3, 3.4	65	32.3, 3.4	65	32.3, 3.4
60	70	32.3, 3.4	70	32.3, 3.4	70	32.3, 3.4	70	32.3, 3.4
65	75	32.3, 3.4	75	32.3, 3.4	75	32.3, 3.4	75	32.3, 3.4
70	80	32.3, 3.4	80	32.3, 3.4	80	32.3, 3.4	80	32.3, 3.4
75	85	32.3, 3.4	85	32.3, 3.4	85	32.3, 3.4	85	32.3, 3.4

NOTES FOR BORING NO. YB - 39

Boring started 10-13-97
Final depth: 10'-0"
Casing diameter: 4"
Average depth of ground water observed in the boring is 10.5' (PH) (CL) (CH)
REMARKS:
Pushed casing to 10' depth.
Used repeat drilling (rod below 10' depth) to maintain hole open.
The depth of groundwater observed in the hole may not be representative due to the presence of casing mud in the hole.
Borehole was grouted upon completion.

BORING NUMBER YB-40U
Ground surface elevation +247.9

0	10	32.3, 3.4	10	32.3, 3.4	10	32.3, 3.4	10	32.3, 3.4
5	15	32.3, 3.4	15	32.3, 3.4	15	32.3, 3.4	15	32.3, 3.4
10	20	32.3, 3.4	20	32.3, 3.4	20	32.3, 3.4	20	32.3, 3.4
15	25	32.3, 3.4	25	32.3, 3.4	25	32.3, 3.4	25	32.3, 3.4
20	30	32.3, 3.4	30	32.3, 3.4	30	32.3, 3.4	30	32.3, 3.4
25	35	32.3, 3.4	35	32.3, 3.4	35	32.3, 3.4	35	32.3, 3.4
30	40	32.3, 3.4	40	32.3, 3.4	40	32.3, 3.4	40	32.3, 3.4
35	45	32.3, 3.4	45	32.3, 3.4	45	32.3, 3.4	45	32.3, 3.4
40	50	32.3, 3.4	50	32.3, 3.4	50	32.3, 3.4	50	32.3, 3.4
45	55	32.3, 3.4	55	32.3, 3.4	55	32.3, 3.4	55	32.3, 3.4
50	60	32.3, 3.4	60	32.3, 3.4	60	32.3, 3.4	60	32.3, 3.4
55	65	32.3, 3.4	65	32.3, 3.4	65	32.3, 3.4	65	32.3, 3.4
60	70	32.3, 3.4	70	32.3, 3.4	70	32.3, 3.4	70	32.3, 3.4
65	75	32.3, 3.4	75	32.3, 3.4	75	32.3, 3.4	75	32.3, 3.4
70	80	32.3, 3.4	80	32.3, 3.4	80	32.3, 3.4	80	32.3, 3.4
75	85	32.3, 3.4	85	32.3, 3.4	85	32.3, 3.4	85	32.3, 3.4

NOTES FOR BORING NO. YB - 40U

Boring started 10-13-97
Final depth: 10'-0"
Casing diameter: 4"
Average depth of ground water observed in the boring is 10.5' (PH) (CL) (CH)
REMARKS:
Pushed casing to 10' depth.
Used repeat drilling (rod below 10' depth) to maintain hole open.
The depth of groundwater observed in the hole may not be representative due to the presence of casing mud in the hole.
Borehole was grouted upon completion.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
DE LEUW, CATHIER & COMPANY
GENERAL ENGINEERING CONSULTANT
HARRY WEESE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT

MUESER RUTLEDGE CONSULTING ENGINEERS
708 THIRD AVENUE, NEW YORK, N.Y. 10017

DESIGNED: A.P. DATE: 1-30-98
DRAWN: F.F. DATE: 1-30-98
CHECKED: M.S.L. DATE: 1-30-98
APPROVED: F.F. DATE: 1-30-98

REVISIONS: DATE BY DESCRIPTION

REFERENCE DRAWINGS: NUMBER DESCRIPTION
1-36 General Notes and Legend
1-37 Boring Location Plan and
1-38 Geological Sections

DESIGNED BY: A.P. DATE: 1-30-98
DRAWN BY: F.F. DATE: 1-30-98
CHECKED BY: M.S.L. DATE: 1-30-98
APPROVED BY: F.F. DATE: 1-30-98

OF COLORADO
No. 1728
REGISTERED PROFESSIONAL ENGINEER

BRAN LOGS OF YB-38U

SCALE: 0' = 1"

BORING NUMBER YB-46
Ground surface elevation = 224.6

DEPTH BELOW GROUND SURFACE, FEET	DESCRIPTION	REMARKS
0	10	12.18, 20.21
5	15	15.12, 14.12
10	20	18.12, 14.12
15	25	15.12, 14.12
20	30	15.12, 14.12
25	35	15.12, 14.12
30	40	15.12, 14.12
35	45	15.12, 14.12
40	50	15.12, 14.12
45	55	15.12, 14.12
50	60	15.12, 14.12

BORING NUMBER YB-47
Ground surface elevation = 224.6

DEPTH BELOW GROUND SURFACE, FEET	DESCRIPTION	REMARKS
0	10	14.32, 20.19
5	15	11.12, 14.37
10	20	11.12, 14.37
15	25	11.12, 14.37
20	30	11.12, 14.37
25	35	11.12, 14.37
30	40	11.12, 14.37
35	45	11.12, 14.37
40	50	11.12, 14.37
45	55	11.12, 14.37
50	60	11.12, 14.37

BORING NUMBER YB-48U
Ground surface elevation = 225.5

DEPTH BELOW GROUND SURFACE, FEET	DESCRIPTION	REMARKS
0	10	16.18, 14.12
5	15	16.18, 14.12
10	20	16.18, 14.12
15	25	16.18, 14.12
20	30	16.18, 14.12
25	35	16.18, 14.12
30	40	16.18, 14.12
35	45	16.18, 14.12
40	50	16.18, 14.12
45	55	16.18, 14.12
50	60	16.18, 14.12

Boring started 10-4-97
Completed 10-4-97
Casing = 5.0"
Casing diameter = 4"
Average depth of ground water observed in the boring = 21.2
=EL. 223.4

REMARKS:
Pushed casing to 10' depth.
Used Revert drilling fluid below 10' depth to maintain hole open.
Observation well consisting of 1-1/2" PVC pipe installed with tip at 45' depth.
Borehole was grouted between 0' and 36' depth.

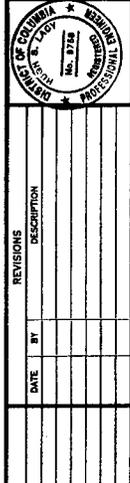
Boring started 10-4-97
Completed 10-4-97
Casing = 10.0"
Casing diameter = 4"
Average depth of ground water observed in the boring = 29.6
=EL. 193.3

REMARKS:
Pushed casing to 10' depth.
Used drilling mud below 10' depth to maintain hole open.
The depth of groundwater observed in the hole may not be representative due to the presence of drilling mud in the hole.
Borehole was grouted upon completion.

Boring started 10-4-97
Completed 10-4-97
Casing = 10.0"
Casing diameter = 4"
Average depth of ground water observed in the boring = 32.6
=EL. 192.3

REMARKS:
Pushed casing to 10' depth.
Used Revert drilling fluid below 10' depth to maintain hole open.
Observation well consisting of 1-1/2" PVC pipe installed with tip at 50' depth.
Borehole was grouted between 0' and 48' depth.

DESIGNED	DATE	REFERENCE DRAWINGS	REVISIONS
AWP	1-2-98	General Notes and Legend	
AWP	1-2-98	General Notes and Legend	
AWP	1-2-98	General Notes and Legend	
AWP	1-2-98	General Notes and Legend	



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
MUESER RUTLEDGE CONSULTING ENGINEERS
 708 THIRD AVENUE, NEW YORK, N.Y. 10017
 DE LEUW, CATHER & COMPANY
 GENERAL ENGINEERING CONSULTANT
 HARRY WESSE & ASSOCIATES
 GENERAL ARCHITECTURAL CONSULTANT
 APPROVED

TEST PIT NUMBER TP-1
Ground surface elevation -274.5

Material Description	Depth
Fill	0 - 3.0'
Light gray clay, trace roots, trace fine sand (FI) (CL)	3.0' - 7.0'
Light brown clay, trace fine sand (FI) (CH)	7.0' - 12.0'
Light brown clay, trace fine sand (FI) (CH)	12.0' - 17.0'

Test pit started 10-9-97
Final depth: 17.0'

completed 10-9-97

REMARKS:
Test pit was excavated with a backhoe.
Soil samples were taken at 5', 11', & 14' depths.
Groundwater level was encountered at 12' depth.
The clay (C) between 12' and 17' depth flowed into the excavation as soon as the face was exposed.

TEST PIT NUMBER TP-2
Ground surface elevation -251.6

Material Description	Depth
Fill	0 - 3.0'
Brown fine to coarse sand and gravel, some silt, roots (FI) (S&G)	3.0' - 7.0'
Light brown clay, trace silt, gravel, medium to coarse sand (FI) (SM)	7.0' - 12.0'
Brown fine sand, some silt (FI) (SM)	12.0' - 15.0'
Gray silty clay (AGUA) (FI)	15.0' - 18.0'

Test pit started 10-10-97
Final depth: 18.0'

completed 10-10-97

REMARKS:
Test pit was excavated with a backhoe.
Soil samples were taken at 1', 5', 9' and 13' depths.
No groundwater level was encountered in this test pit.

TEST PIT NUMBER TP-3
Ground surface elevation -246.7

Material Description	Depth
Fill	0 - 1.0'
Hard brown clay, trace roots, vegetation (FI) (CH)	1.0' - 5.0'
Soft brown clay, some silt, trace clay pockets (FI) (CH) (SM)	5.0' - 10.0'
Brown gray fine sandy silt, trace clay pockets, medium to coarse sand, gravel (FI) (ML)	10.0' - 13.0'
Gray clay, trace fine sand (FI) (CH)	13.0' - 17.0'

Test pit started 10-9-97
Final depth: 17.0'

completed 10-9-97

REMARKS:
Test pit was excavated with a backhoe.
Soil samples were taken at 5', 10' and 14' depths.
No groundwater level was encountered in this test pit.

TEST PIT NUMBER TP-4
Ground surface elevation -232.4

Material Description	Depth
Fill	0 - 5.0'
Brown fine sand, some silt, trace organics (FI) (SM)	5.0' - 10.0'
Brown fine sand, some silt (FI) (SM)	10.0' - 15.0'
Gray clay (S&G) (FI) (CH)	15.0' - 18.0'
GRAY CLAY (BUCKENSHED) (AGUA) (FI)	18.0' - 19.0'

Test pit started 10-10-97
Final depth: 19.0'

completed 10-10-97

REMARKS:
Test pit was excavated with a backhoe.
Soil samples were taken at 1', 5', 9' and 14' depths.
Groundwater level was encountered at 8' depth.

TEST PIT NUMBER TP-1A
Ground surface elevation -274.4

Material Description	Depth
Fill	0 - 8.0'

Test pit started 11-10-97
Final depth: 8.0'

completed 11-10-97

REMARKS:
Test pit was excavated with a backhoe.
Soil sample was taken at 8' depth.
No groundwater level was encountered in this test pit.

TEST PIT NUMBER TP-2A
Ground surface elevation -251.6

Material Description	Depth
Fill	0 - 3.0'
BRANDYWINE (FI)	3.0' - 9.0'

Test pit started 11-10-97
Final depth: 9.0'

completed 11-10-97

REMARKS:
Test pit was excavated with a backhoe.
Soil sample was taken at 9' depth.
Groundwater level was encountered at 5' depth.

TEST PIT NUMBER TP-3A
Ground surface elevation -246.7

Material Description	Depth
Fill	0 - 8.0'

Test pit started 11-10-97
Final depth: 8.0'

completed 11-10-97

REMARKS:
Test pit was excavated with a backhoe.
Soil sample was taken at 8' depth.
No groundwater level was encountered in this test pit.

TEST PIT NUMBER TP-4A
Ground surface elevation -232.4

Material Description	Depth
Fill	0 - 5.0'

Test pit started 11-10-97
Final depth: 5.0'

completed 11-10-97

REMARKS:
Test pit was excavated with a backhoe.
Soil sample was taken at 5' depth.
No groundwater level was encountered in this test pit.

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

MUESER RUTLEDGE CONSULTING ENGINEERS
708 THIRD AVENUE, NEW YORK, N.Y. 10017

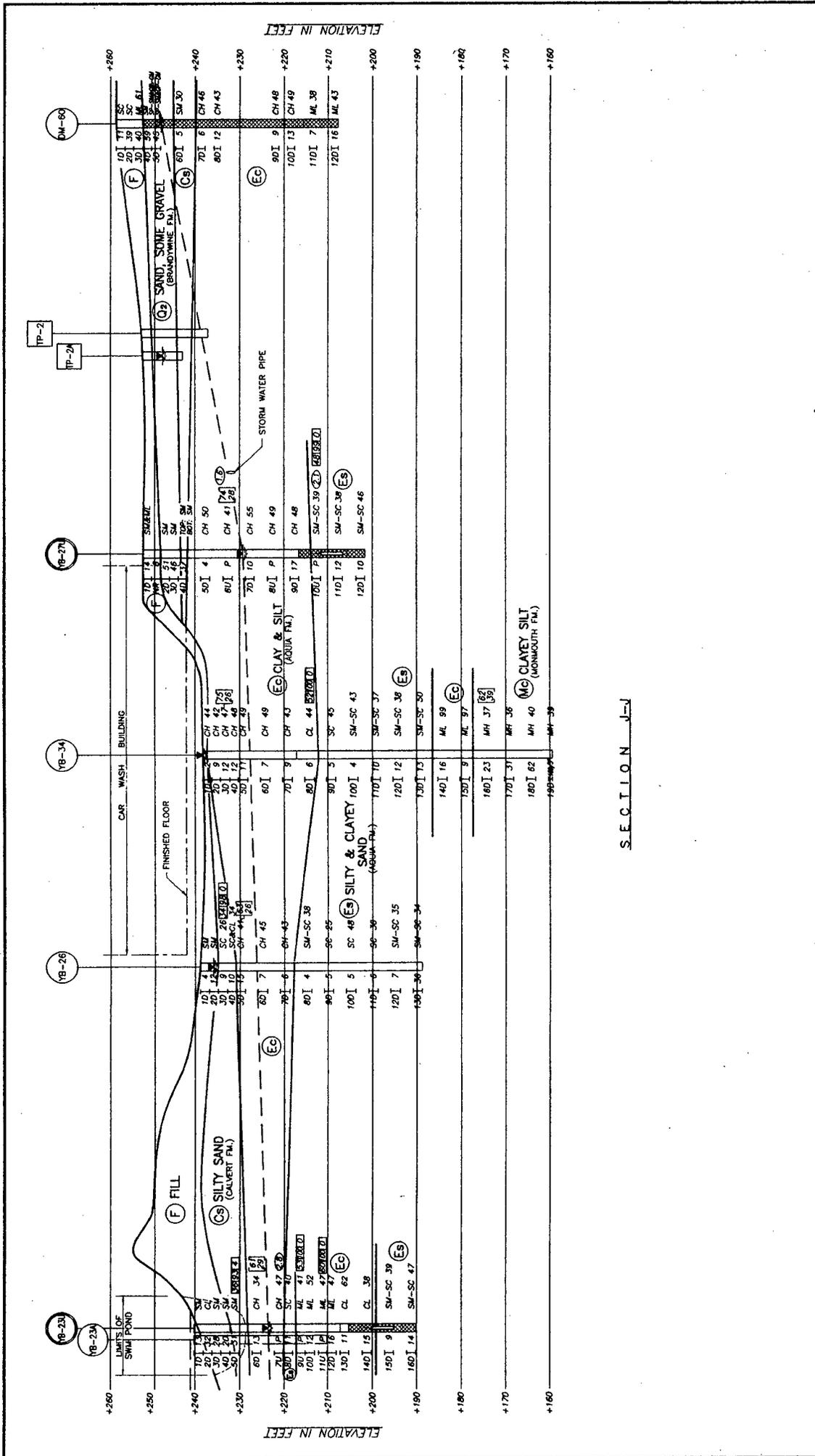
**BRANCH ROUTE (F011)
LOGS OF TEST PITS
TP-1 THRU TP-4 AND TP-1A THRU TP-4A**

DATE: 11-10-97
DRAWING NO.: F-F-483

DATE	NUMBER	REVISIONS
11-10-97	1	GENERAL NOTES FOR LOGS
11-10-97	2	SOIL LOCATION, PLOTS and
11-10-97	3	SECTIONAL SECTIONS
11-10-97	4	
11-10-97	5	

APPROVED: *[Signature]*

DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANT
HARRY WESSE & ASSOCIATES
GENERAL ARCHITECTURAL CONSULTANT



ELEVATION IN FEET

ELEVATION IN FEET

SECTION J-J

DATE: _____ BY: _____ CHECKED: HSL, SI, AA, 8-97 DATE: _____		REFERENCE DRAWINGS: DESCRIPTION: _____ DATE: _____ BY: _____ GENERAL NOTES: _____ GENERAL STATION DESCRIPTIONS: _____ F-F-457 BORING LOCATION PLAN		WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY DE LEIN, GATHER & COMPANY GENERAL ENGINEERS CONSULTANT HARRY WEISSE & ASSOCIATES GENERAL ARCHITECTURAL CONSULTANT	
DRAWN BY: _____ DATE: _____		PROJECT: BRANCH AVENUE YARD SECTION: J-J		SCALE: _____ HORIZ: _____ VERT: _____	
APPROVED: _____ DATE: _____		APPROVED: _____ DATE: _____		F-F-463	

APPENDIX

LABORATORY TEST RESULTS FROM EARLIER WMATA
INVESTIGATIONS ON SOILS OF CALVERT, AQUIA
AND MONMOUTH FORMATIONS

TABLE NO. 2
SUMMARY OF LABORATORY TEST DATA **REPORT NO. 244**
SECTION FO09, BRANCH ROUTE

SAMPLE IDENTIFICATION				CLASSIFICATION PROPERTIES							PHYSICAL PROPERTIES															
BORING NUMBER	SAMPLE NUMBER	DEPTH FT.	STRATUM DESIGNATION	NATURAL WATER CONTENT % (W) AVERAGE OF ENTIRE SAMPLE	LIQUID LIMIT (W _L)	PLASTICITY INDEX (I _p)	NATURAL WATER CONTENT OF LIMIT SAMPLE, W _n %	SPECIFIC GRAVITY OF SOLIDS (G _s)	DRY DENSITY, PCF	UNIFIED SOIL CLASSIFICATION SYSTEM			UNCONFINED COMPRESSION			TRIAxIAL COMPRESSION				CONSOLIDATION						
										SOIL TYPE	% SAND (<# 4 -#200 SIEVE)	% FINES (<#200 SIEVE)	COMPRESSIVE STRENGTH TSF	WATER CONTENT AT END OF TEST, %	STRAIN AT FAILURE, %	TYPE OF TEST	DEVIATOR STRESS (q - q _u) TSF	CONFINING PRESSURE (σ ₃) TSF	NATURAL WATER CONTENT, W _n , %	WATER CONTENT AT END OF TEST, W _t , %	NATURAL WATER CONTENT, W _n , %	EXISTING OVERBURDEN STRESS, R _b , TSF	ESTIMATED PRECONSOLIDATION STRESS, P _c , TSF	COMPRESSION INDEX, C _c	SWELLING INDEX, C _s	
RKK-2U	7U	16	Cc&Ec Cc Cc	58 49 60						MH&CH MH CH						Q Q Q	1.48 2.50 0.98	0.5 1.0 2.0	58 49 60	58 49 60						
RKK-6U	12U 16U	36 51	Ec Ec	49 63	79 110	49 59	49 77	2.77		CH MH MH MH						Q Q Q Q	3.05 4.56 4.17 5.89	1.0 0.5 1.0 2.0	49 58 60 69	49 60 60 69	49.5	2.3	10.0	1.120	0.140	
RKK-6AU	1U 2U BOT	11 16	Cs&Cc Es	33 39				2.74		SM-SC SM-SC &CL SC	20	80				Q Q Q	0.62 0.71 0.88	0.5 1.0 1.0	28 38 36	27 37 35						
RKK-12U	7U	13	Cc	55	90	57	59			CH						Q	1.04	2.0	66	66						
RKK-14U	7U 11U	16 31	Cs&Cc Es	16 38	33	2	37			SM-SC &CL SM-SC SM-SC SM-SC	52	48				Q Q Q	1.46 1.51 1.95	0.5 1.0 2.0	38 38 40	37 38 39						
RKK-18U	9U 12U	19 31	Cc Ec	35 41	49	17	26			CL CL ML						Q Q Q	0.87 0.77 1.25	1.0 1.0 1.0	30 41 43	30 41 44						
RKK-21U	8U 11U	21 36	Cc Es	45 39	59	27	45	2.73		MH MH MH SM-SC						Q Q Q Q	0.91 1.04 0.86 2.19	0.5 1.0 2.0 1.5	45 47 47 39	46 47 48 39	42.6	1.2	2.7	0.450	0.035	

NOTES

- ALL TESTS SUMMARIZED ABOVE WERE PERFORMED IN THE SOILS LABORATORY OF MUESER RUTLEDGE CONSULTING ENGINEERS.
- THE SAMPLE DEPTH LISTED ABOVE IS THE AVERAGE DEPTH OF THE SAMPLE RECOVERED.
- FOR GROUND SURFACE ELEVATIONS AT THE BORINGS SEE TABLE NO. 1. FOR GENERALIZED STRATA DESCRIPTIONS SEE DRAWING NO. F-1.
- "NATURAL WATER CONTENT OF THE ENTIRE SAMPLE" IS A WEIGHTED AVERAGE OF ALL MATERIAL TYPES RECOVERED.
- THE TRIAXIAL COMPRESSION TESTS PERFORMED WERE:
 Q - QUICK TESTS (UU - UNCONSOLIDATED UNDRAINED TESTS)
 Qc - CONSOLIDATED QUICK TESTS (CU - CONSOLIDATED UNDRAINED TESTS)
- STRENGTH TESTS WERE PERFORMED ON PISTON TYPE SAMPLES (U) APPROXIMATELY 2.9 INCHES IN DIAMETER AND ON SHELBY TYPE SAMPLES (S) APPROXIMATELY 1.8 INCHES IN DIAMETER. THE RATIO OF HEIGHT TO DIAMETER OF ALL STRENGTH TEST SPECIMENS WAS APPROXIMATELY 2.0.
- THE TRIAXIAL COMPRESSION TESTS WERE PERFORMED AT A RATE OF STRAIN OF APPROXIMATELY 1 PER CENT PER MINUTE.
- THE DIRECT SHEAR TESTS WERE PERFORMED AT A CONSTANT RATE OF STRAIN EQUAL TO A HORIZONTAL DISPLACEMENT OF 0.02 INCHES PER HOUR. THE SPECIMENS WERE OF APPROXIMATELY 1/2 INCH THICKNESS.
- COMPRESSION INDEX C_c - STRAIGHT LINE PORTION OF THE VIRGIN CURVE OF CONSOLIDATION TEST: e = e₀ - C_c LOG P/P₀
- SWELLING INDEX C_s - STRAIGHT LINE PORTION OF THE REBOUND CURVE OF CONSOLIDATION TEST: e = e₀ - C_s LOG P/P₀

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
PARSONS DE LEUW, INC.
 GENERAL ENGINEERING CONSULTANTS

TABLE NO. 2

REPORT NO. 244

SUMMARY OF LABORATORY TEST DATA (CONT'D) SECTION F009, BRANCH ROUTE

SAMPLE IDENTIFICATION				CLASSIFICATION PROPERTIES							PHYSICAL PROPERTIES													
BORING NUMBER	SAMPLE NUMBER	DEPTH FT.	STRATUM DESIGNATION	NATURAL WATER CONTENT % (W) AVERAGE OF ENTIRE SAMPLE	LIQUID LIMIT, W _L , %	PLASTICITY INDEX, I _p , %	NATURAL WATER CONTENT OF LIMIT SAMPLE, W _n , %	SPECIFIC GRAVITY OF SOLIDS, G _s	DRY DENSITY, PCF	UNIFIED SOIL CLASSIFICATION SYSTEM			UNCONFINED COMPRESSION			TRIAXIAL COMPRESSION				CONSOLIDATION				
										SOIL TYPE	% SAND (<# 4 >#200 SIEVE)	% FINES (<#200 SIEVE)	COMPRESSIVE STRENGTH TSF	WATER CONTENT AT END OF TEST, %	STRAIN AT FAILURE, %	TYPE OF TEST	COMPRESSIVE STRENGTH (σ ₁ - σ ₃), TSF	CONFINING PRESSURE σ ₃ , TSF	NATURAL WATER CONTENT, W _n , %	WATER CONTENT AT END OF TEST, W _f , %	NATURAL WATER CONTENT, W _n , %	EXISTING OVERBURDEN STRESS, R _b , TSF	ESTIMATED PRECONSOLIDATION STRESS, P _c , TSF	COMPRESSION INDEX, C _c
RKK-26U	12U	31	Cs Cs Cs&Cc	43						SC SC SC&CL				Q Q Q	0.73 0.85 0.98	0.5 1.0 2.0	42 44 43	43 44 39						
	14U	41	Ec	38						CL				Q	1.28	1.5	38	38						
RKK-35U	9U	26	Es	37	41	15	44			SM SM SM				Q Q Q	0.79 0.93 1.05	0.5 1.0 2.0	39 38 33	37 35 33						
	11U	36	Es							SM				Q	1.51 1.48	1.0 1.5	32 34	32 34						
	14U	51	Es	39						SM-SC				Q	2.48	2.0	40	40						
	18U	69.7	Ec	47	85	50	54			CH				Q	2.76	2.0	45	45						
RKK-37AU	6U	34	Cs	30						SM SM SM	85 34	15 22		Q Q Q	1.12 1.50 4.11	0.5 1.0 2.0	29 31 30	29 30 29						
	8U	41	Cs	39						SM-SC				Q	0.49	2.0	39	38						
	11U	51	Es	40						SM				Q	1.57	2.5	40	39						
	16U	66	Ec	59	72	41	59			CH				Q										
RKK-38U	11U	36	Cs	21						SM-SC SM-SC SM-SC				Q Q Q	1.36 0.33 6.49	0.5 1.0 2.0	22 20 21	22 20 21						
	15U	55.7	Cs	25						SP-SM	94	6		Q	3.04	1.0	25	25						
	17U	64	Cc&Cs	36						CL&SC				Q Q	1.08 0.99	1.0 2.0	36 36	36 36						
RKKSW-4U	16U	58	Ec	48	83	49	50			CH CH CH				Q Q Q	3.55 3.71 2.60	0.5 1.0 2.0	50 49 46	50 49 45						
	13U	46	Es	35						SM-SC SM-SC SM-SC	82	18		Q Q Q	1.36 1.66 2.57	0.5 1.0 2.0	36 36 35	36 36 35						
	19U	70.9	Ec	51	74	42	51			CH														

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PARSONS DE LEUW, INC.

TABLE NO. 2 **REPORT NO. 246**
SUMMARY OF LABORATORY TEST DATA **SECTION FO10, BRANCH ROUTE**

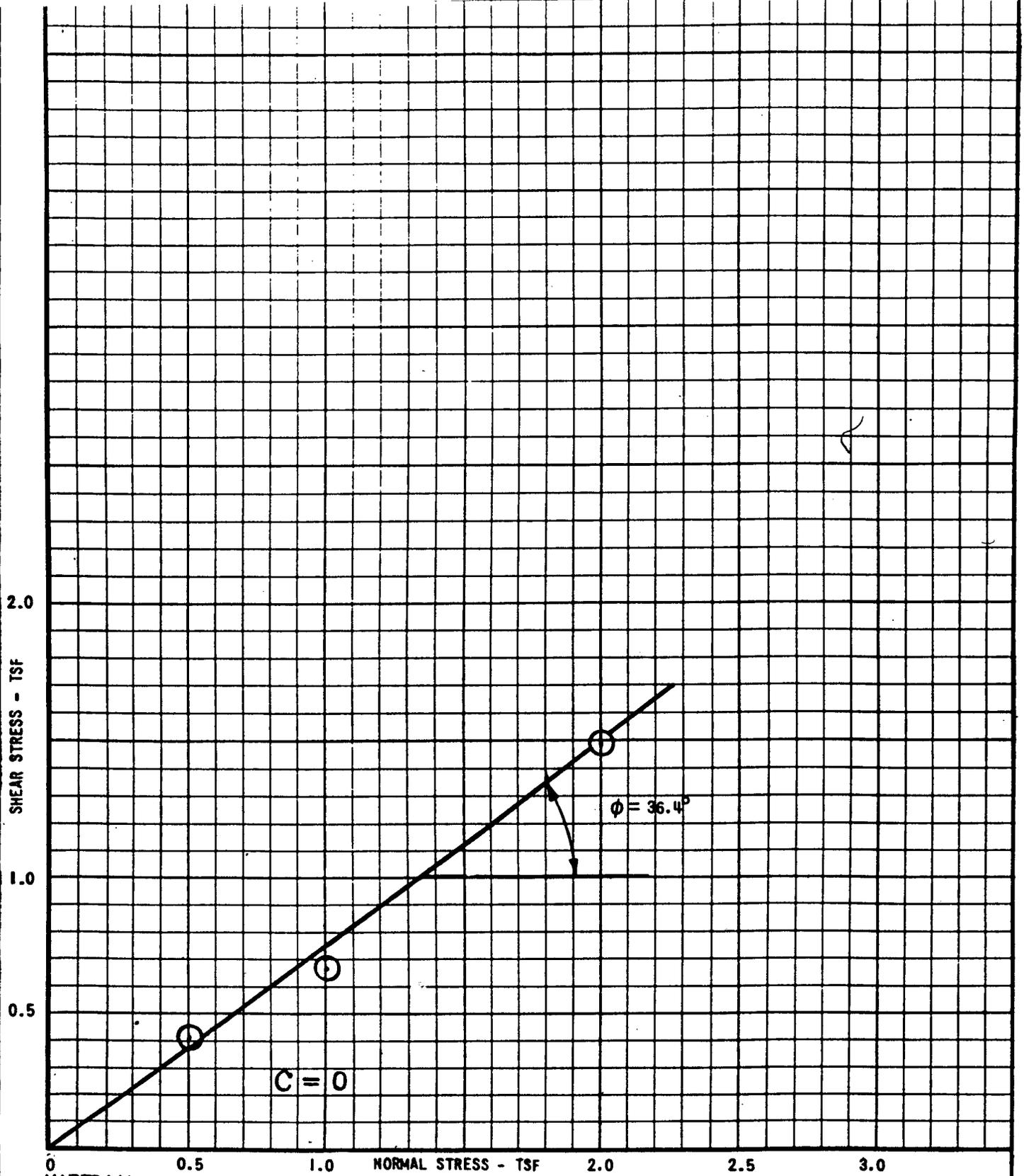
SAMPLE IDENTIFICATION				CLASSIFICATION PROPERTIES										PHYSICAL PROPERTIES											
														STRENGTH					CONSOLIDATION						
BORING NUMBER	SAMPLE NUMBER	DEPTH FT.	STRATUM DESIGNATION	NATURAL WATER CONTENT % (W) AVERAGE OF ENTIRE SAMPLE	LIQUID LIMIT (W _L)	PLASTICITY INDEX (I _p)	NATURAL WATER CONTENT OF LIMIT SAMPLE, W _n , %	SPECIFIC GRAVITY OF SOLIDS (G _s)	DRY DENSITY, PCF	UNIFIED SOIL CLASSIFICATION SYSTEM		UNCONFINED COMPRESSION			TRIAXIAL COMPRESSION				NATURAL WATER CONTENT, W _n , %	EXISTING OVERBURDEN STRESS, P _o , TSF	ESTIMATED PRECONSOLIDATION STRESS, P _e , TSF	COMPRESSION INDEX, C _c	SWELLING INDEX, C _s		
										SOIL TYPE	% SAND (<# 4 >#200 SIEVE)	% FINES (<#200 SIEVE)	COMPRESSIVE STRENGTH TSF	WATER CONTENT AT END OF TEST, %	STRAIN AT FAILURE, %	TYPE OF TEST	DEVIATOR STRESS (q - q ₃) TSF	CONFINING PRESSURE (q ₃) TSF						NATURAL WATER CONTENT, W _n , %	WATER CONTENT AT END OF TEST, W _e , %
DM-7U	14U	41	Cs	29						SC					Q	3.21	1.0	29	28						
	23U	71	Es	26						SM					Q	2.77	1.0	26	27						
DM-19U	11U	33.5	Es	31					91	SM					Q	3.80	1.0	32	32						
	15U	46.5	Ms	28					94	SM	69	26			Q	3.59	0.5	31	31						
									94	SM					Q	3.88	1.0	31	31						
									103	SM					Q	5.48	2.0	24	24						
	21U	71.5	Ms	30					102	SM					Q	5.91	2.0	30	30						
DM-40U	15U	56	Es	31						SM					Q	2.07	1.5	32	33						
										SM					Q	2.37	2.0	31	31						
	21U	76	Es	33						SM					Q	4.30	2.5	33	33						
DM-43AU	25U	115	Ms	24						SP-SM	91	9			Q	2.98	0.5	24	24						
	26U	119.5	Ms	27						SM					Q	3.28	1.0	27	27						
	28U	126.5	Ms	24						SM					Q	5.50	2.0	24	24						
DM-45U	14U	51	Ec	42	73	47	42	2.75		CH					Q	1.53	0.5	43	43	41.5	2.4	6.2	0.768	0.120	
										CH					Q	3.22	1.0	42	42						
	20U	71	Ec	40						ML					Q	3.13	2.0	42	42						
										ML					Q	4.41	2.0	41	41						
										ML					Q	4.66	2.5	39	39						
DM-58U	16U	61	Ec	43						CL	40	60			Q	2.30	0.5	43	43						
										CL					Q	2.03	1.0	44	44						
	22U	81	Es	37						SM					Q	2.28	1.5	37	37						
										SM					Q	3.40	2.0	38	37						

NOTES

- 1 ALL TESTS SUMMARIZED ABOVE WERE PERFORMED IN THE SOILS LABORATORY OF MUESER RUTLEDGE CONSULTING ENGINEERS.
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- 9 COMPRESSION INDEX C_c - STRAIGHT LINE PORTION OF THE VIRGIN CURVE OF CONSOLIDATION TEST e = e_o - C_c LOG P/P_o
- 10 SWELLING INDEX C_s - STRAIGHT LINE PORTION OF THE REBOUND CURVE OF CONSOLIDATION TEST. e = e_o - C_s LOG P/P_o

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MATERIAL: BROWN FINE SAND, SOME SILT
STRATUM (C)

BORING NUMBER	SAMPLE NUMBER	FINAL CONDITION			
		WATER CONTENT	PER CENT SATURATION	NORMAL STRESS TSF	SHEAR STRESS TSF
F-197U	13U	25	100+	0.5	0.40
		26		1.0	0.66
		26		2.0	1.48

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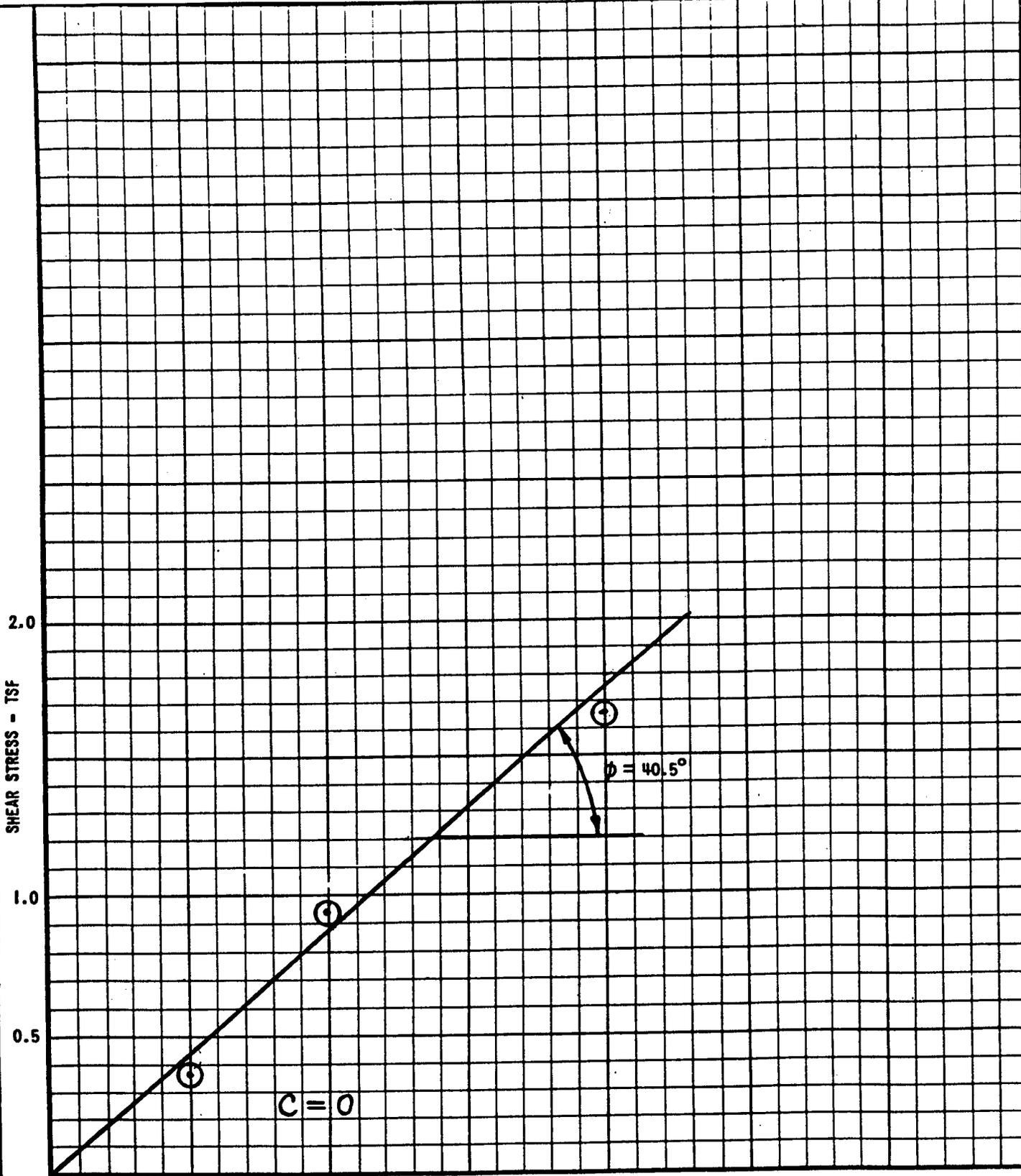
DE LEUW, CATHER & COMPANY
GENERAL ENGINEERING CONSULTANTS

MUESER-RUTLEDGE-WENTWORTH & JOHNSTON
CONSULTING ENGINEERS
415 MADISON AVE. NEW YORK 17, N.Y.

MADE BY: AAK DATE: 8-17-75 FILE NO. 3291L
CHECKED BY: VLT DATE: 8-19-75

DIRECT SHEAR TEST
BORING F-197U SAMPLE 13U

PLATE NO. A55



MATERIAL: DARK GRAY SILTY FINE SAND, SOME CLAY, TRACE SHELLS STRATUM (E)

BORING NUMBER	SAMPLE NUMBER	FINAL CONDITION			
		WATER CONTENT	PER CENT SATURATION	NORMAL STRESS TSF	SHEAR STRESS TSF
F-204U	6U	32	100+	0.5	0.43
		32		1.0	1.04
		32		2.0	1.83

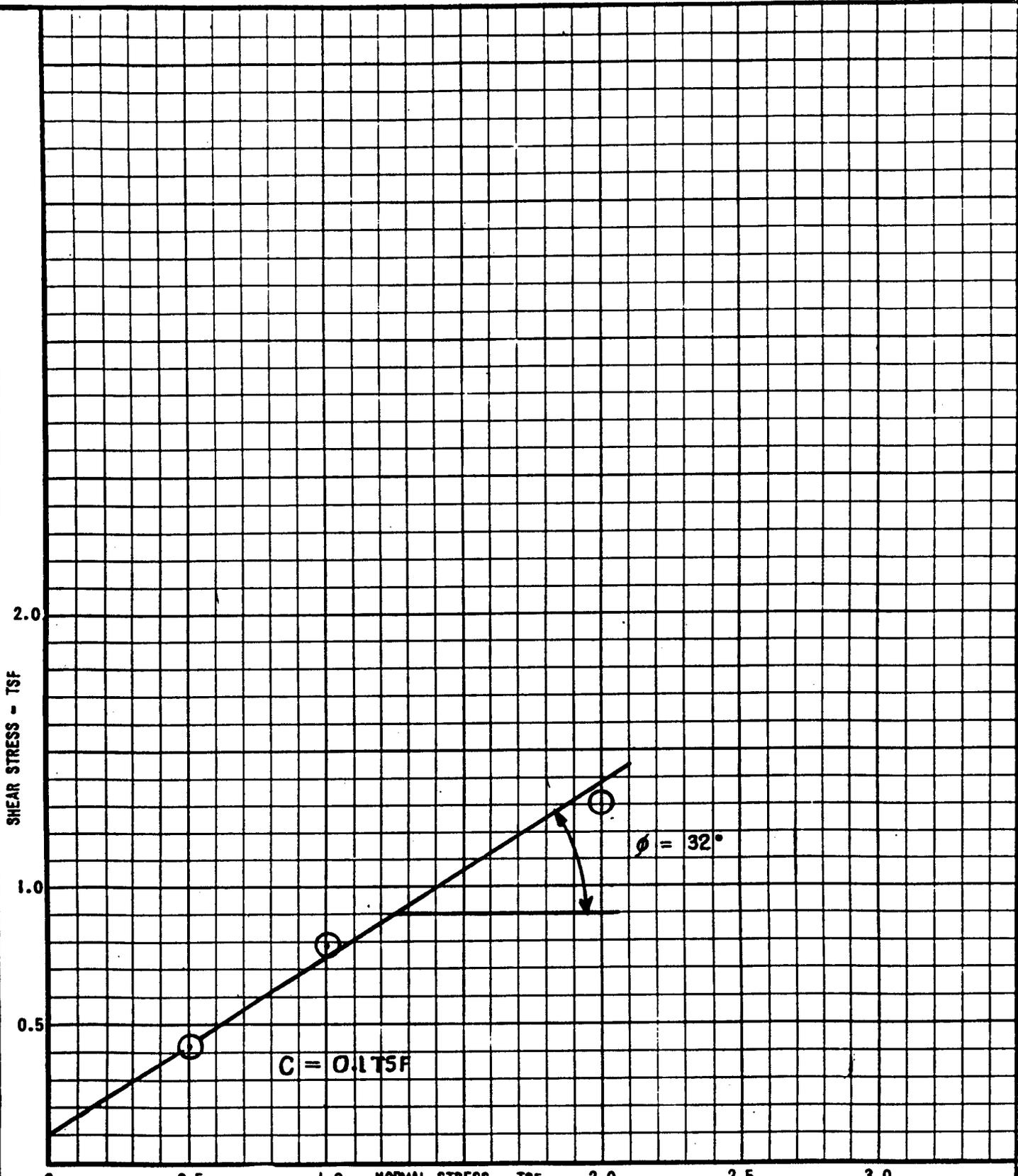
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 CONSULTING ENGINEERS
 415 MADISON AVE. NEW YORK 17, N.Y.

MADE BY: AAK DATE: 9-19-75 FILE NO. 32911
 CHECKED BY: VLT DATE: 9-18-75

DIRECT SHEAR TEST
 BORING F-204U SAMPLE 6U

PLATE NO. A56



0 0.5 1.0 2.0 2.5 3.0
 MATERIAL: DARK GREEN-GRAY FINE SAND AND SILT
 STRATUM (E)

BORING NUMBER	SAMPLE NUMBER	FINAL CONDITION			
		WATER CONTENT	PER CENT SATURATION	NORMAL STRESS TSF	SHEAR STRESS TSF
F-207U	8U	30	100+	0.5	0.42
		28		1.0	0.78
		29		2.0	1.30

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 415 MADISON AVE. NEW YORK 17, N.Y.
 MADE BY: AAK DATE: 9-25-75 FILE NO. 3291L
 CHECKED BY: DATE: PLATE NO. A57
 DIRECT SHEAR TEST
 BORING F-207U SAMPLE 8U

GROUND SURFACE ELEVATION = APPROXIMATELY +270

TESTS INCLUDE ALL VALUES FOR THIN TUBE SAMPLES FROM BORINGS NOS. F-81 TO F-92, STATIONS 247 TO 286, GENERALLY COVERING HIGH GROUND SURROUNDING ALABAMA AVENUE STATION

DESCRIPTORS OF STRATA

SYMBOLS FOR TESTS

▲ CALVERT STRATUM (C)
 ▼ MORHOUGH STRATUM (M)
 ◆
 ◆
 ◆

▼ - TESTS ON SAMPLE 8U FROM BORING No. RKK-21U

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MADE BY: JRG DATE: 12-72
 CHECKED BY: JRG DATE: 12-72

FILE NO. 3281E
 PART NO. 12

